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A. C. TRUE, DIRECTOR

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[a] The circular on Cooperative Forestry Work for 1908, previously noted as Circular 74 (E. S. R., 19, p. 654) has been relisted by the station as Circular 75.

EXPERIMENT STATION RECORD.

VOL. XIX. SEPTEMBER, 1907. NO. 1.

Seven years ago the quarter centennial of the first experiment station established in this country was celebrated at New Haven, in connection with the annual convention of the Association of American Agricultural Colleges and Experiment Stations. It commemorated the beginning of an epoch-making public policy which has already resulted in quite as important advancement as science has ever wrought in any industry. This year is the twenty-fifth anniversary of four other stations—Massachusetts, New York, Ohio, and Tennessee—which, taken with the fact that three others had been established between 1875 and 1882, shows how steady was the growth of the experiment station idea.

The New York State Station observed its anniversary in field day exercises held on its grounds August 29. An attendance of over 3,000 filled to overflowing the large tent which had been erected for the occasion. The governor of the State lent encouragement by his presence and his words, giving public recognition of the significance of the anniversary to the State. The programme also included addresses by local members of Congress and the State legislature; representatives of the State department of agriculture and the State grange; President W. O. Thompson, of Ohio State University; and Dean Bailey, of Cornell University; together with an introductory address by the director, and remarks of a reminiscent nature by the sole surviving member of the board of control.

Following so closely upon the celebration of the fiftieth anniversary of the first agriculture college in this country, the exercises at Geneva were likewise of more than local significance. Popular attention was again forcefully directed to the substantial nature of agricultural progress during the last generation, and especially was opportunity afforded for emphasizing the influence of agricultural research in this development.

How great have been the advances in agricultural practice may be realized, in part, by reference to a brief summary appearing in the first report of the station and dealing with the conditions prevailing in New York at the time of its establishment. Agriculturally, as Doctor Jordan expressed it in his remarks, the period was one of transition from the sway of tradition and superstition to the domain of exact knowledge. During the seventies the work of the farm had become unexpectedly complex, and hindrances unknown to the earlier husbandry had increased the hazards attending farm practice. Many sections were suffering seriously from an exhaustion of the soil; new and unknown insects appeared in great numbers; noxious weeds multiplied with extreme rapidity, and unfamiliar diseases worked havoc in flocks and herds. The futility of individual experiment and the inadequacy of existing agencies in combating such conditions were in due season appreciated, and led to a demand for the State to cope with the problem. The result was the provision, in 1880, for an agricultural experiment station as a State institution, for the purpose of "promoting agriculture in its various branches by scientific investigation and experiment," and its actual commencement of work in the spring of 1882.

Although experiment stations were already in existence in California, Connecticut, New Jersey, and North Carolina, and agricultural experimentation was slowly taking concrete form at a number of the agricultural colleges, the institution at Geneva found itself in many respects a pioneer. The prevailing model of the time was the German experiment station, in which a characteristic feature was the control work; and in the existing stations the inspection of fertilizers had usually been a prominent function from the start. At Geneva, however, such duties were not imposed until 1894, and by that time a spirit of strict adherence to the work of investigation, unhampered by routine analysis, had become well established.

A second divergence from the prevailing type was as to the form of organization. Instead of affiliation with an existing college or university as its research department, the institution was established, and has since been maintained, on an entirely independent basis, a circumstance insuring to its personnel exemption from the exactions of an undue amount of teaching and thereby favorable to concentration of effort.

A third distinctive feature was the liberal financial support accorded it at the outset. Instead of starting with an initial appropriation of $5,000 a year, as did its predecessors, much of which was of necessity expended for equipment, the Geneva Station received a maintenance appropriation of $20,000 a year, together with $30,000 for buildings and grounds, a substantial recognition of its needs and of the service expected of it. This gave it a distinct advantage in planning and organizing its work, and the continuance of this generous support as the needs and activities of the station have grown has been no small factor in its consistent development. To-day its annual income aggregates over $90,000, of which but $2,400 is obtained from Federal sources, making it still, as in the beginning, the most liberally supported by the State of any of these institutions.

Still another important element which has made for prosperity at the station has been the character of its personnel. During the twenty-five years the position of director has changed but twice, and other positions in the station have enjoyed unusual freedom from change. From the time when Babcock, Goff, and Wing formed with the director its entire scientific staff, there has been maintained not merely a high degree of efficiency, but also a spirit of fidelity to high ideals of research. Not the least of the services of the station has been as a training ground for investigators, through whom its influence has been potent and widespread.

A comparison of the station of 1907 with that of 1882 exemplifies the remarkable expansion of activities which has characterized our progress during that time. From a scientific staff of four, representing the basal departments of agriculture, chemistry, and horticulture, the number of scientific and clerical workers has increased to thirty-one, with the establishment of new departments of animal industry, bacteriology, botany, dairying, and entomology. In addition, special officers are now necessary for exclusive attention to the general supervision of the work, the editing and mailing of the publications, and similar lines. Fifteen laboratory and other buildings are in use, with five more to be added in the near future. A few short articles sent out to newspapers of the State and a brief annual report of small circulation sufficed in the earlier days for the dissemination of the results of the station's work. At present the publications number about fifteen each year, most of which are reprinted in condensed popular form in editions of forty-five thousand copies.

With these improved facilities for service on the part of the station has developed a steadily increasing appreciation from the general public. The newly organized institution faced a constituency which, while hopeful, was none the less to a degree apprehensive that the new effort might be fanciful and visionary in its origin and would be impractical in its results. To-day, to quote again from Doctor Jordan, "the agricultural scientist feels that his right to live and labor is recognized. Members of our staff are listened to with respect and confidence, . . . and their advice is freely sought concerning troublesome farm problems." During the first year of the station's existence about 500 letters of inquiry were received. At present the number of replies sent out aggregates from 10,000 to 15,000 each year.

In fact, to such an extent has public interest developed that Doctor Jordan deemed necessary a word of warning. "It is," said he, "a real menace to research work that the worth to agriculture of the men of the colleges and stations is so largely judged by popular efforts. . . . If the members of this station staff were to meet all the calls they have for speaking and for visitation to different localities in the State, dust would settle on the crucible and the microscope." He took occasion to emphasize the importance of close adherence to thorough and scientific investigations as indispensable to the most satisfactory and permanent results.

A reason for the need of this careful concentration of activity in research was indicated by Governor Hughes in a speech warmly commendatory of the twenty-five years of patient, quiet, and effective effort of the station. In his opinion the scientific method, of which the station was to be regarded as an exponent, is to be defined as a patient, careful, persistent pursuit of truth—a fundamental principle which he declared of general application in all human affairs. "What we want," he went on to say, "is reason in agriculture. It is what we want in connection with every other field of noble effort. We want training, we want intelligence, we want scientific method, we want direction, we want the way shown, and then the man, in a way, can walk in it."

In an address on Lessons of the Day, Dean Bailey declared the fundamental purpose of the stations to be to increase the fertility and productiveness of the land. In his opinion a practical problem confronting them was the reclamation of the "abandoned farm," the economic aspects of which he discussed at length. A broad conception of the function of the stations was also shown in the address of President Thompson on National and State Aid to Investigation, who believed the principles underlying Federal legislation in their behalf to be based on the "general-welfare" clause of the Constitution.

Such evidence of progress in development, in our thinking and our ideals, and in public appreciation are gratifying to the stations as a whole and reflect credit on the efficiency and fruitfulness of our national system. Not until 1918 will its youngest member reach its twenty-fifth anniversary. Who would attempt to predict the development in the meantime?

Dr. George Chapman Caldwell, emeritus professor of chemistry in Cornell University and for many years prominently identified with the progress of agricultural chemistry in this country, died in a sanitarium September 5, at the age of 73 years. Doctor Caldwell was one of the early workers in agricultural experimentation in this country, a writer and lecturer upon various phases of agricultural science, and a specialist in the development and perfection of methods for agricultural analysis. His book entitled "Agricultural Chemical Analysis," issued in 1869, was a pioneer and long remained the standard work in English upon that subject.

Doctor Caldwell brought to his life work a broad and thorough training, gained at the Lawrence Scientific School of Harvard and the universities of Göttingen and Heidelberg. He received his doctor's degree from the former institution in 1857, being a student of the famous Wöhler at the time when the latter was at the height of his career. Returning to this country he was for a year assistant in chemistry at Columbia, professor of chemistry, physics, and botany at Antioch College, in Ohio, from 1859 to '62, and professor of chemistry in the Pennsylvania Agricultural College from '64 to '68. The interval between '62 and '64 was spent in the service of the United States Sanitary Commission. He was called to Cornell in 1868, being the first professor appointed in that institution, and remaining in active service for thirty-five years.

When the Cornell University Agricultural Experiment Station was organized in 1879 he was elected director, and the three reports published by the station contained many papers by him upon the results of fertilizer experiments, feeding experiments with cows and on maintenance rations for steers, the influence of feed on the composition of milk, sugar-beet culture, and methods of agricultural analysis. When the station was reorganized in 1887 he became chemist, and continued in that office until his retirement in 1902.

It was as a teacher quite as much as an investigator that Doctor Caldwell contributed to the advancement of agricultural science and practice. To a large number of students he opened up the needs and possibilities of agricultural investigation and gave an inspiration to enter that field in the search for truth. Upon these he impressed an intelligent appreciation of the requirements of that work, especially the necessity for thoroughness and exactness in plan and method at every stage of the undertaking. Although not active for several years past, owing to failing health, his work has been continued in the students who have gone out from his instruction into experiment station work, and who have carried to it the zeal and the love for truth which he imparted.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Chemical method for the determination of the available phosphoric acid in soils, A. DE 'SIGMOND (*Jour. Amer. Chem. Soc., 29 (1907), No. 6, pp. 929-936, fig. 1*).—The author here briefly describes the method which he has used for the determination of the available phosphoric acid in soils in connection with an elaborate study of the fertilizer requirements of Hungarian soils for which he was awarded a prize by the Hungarian Academy of Sciences. The method is as follows:

"1. *The determination of the basicity of the soil.*—Titrating 25 gm. of soil with a standard solution of nitric acid, containing 100 mg. N_2O_5 per liter, and boiling the soil, to drive out all the carbonic acid, we get at the basicity of the soil, that is the amount of nitric acid neutralized by the soil. The author uses the term basicity for the number of milligrams N_2O_5 for complete neutralization of 25 gm. of the soil.

"Weigh 25 gm. air-dried soil in a beaker, add a small amount of water and 10 cc. of the standard nitric-acid solution. Then boil the solution until the carbonic acid escapes, test with litmus paper, and if the reaction is not distinctly acid, add again 10 cc. of nitric acid, boil, and test again with litmus paper. Repeat this until there is a distinct excess of acid. Then pour the whole contents of the beaker into a standard flask of 500 cc., fill up, shake, filter, and determine in 50 cc. the excess of acid with a standard solution of potassium hydroxid such that 1 cc. neutralizes 10 mg. N_2O_5. Use methyl orange as indicator. By calculating the number of milligrams of N_2O_5 neutralized by 25 gm. of soil, we get the basicity of the soil.

"With soils which on adding some acid effervesce distinctly, the author has found it better to use only 5 gm. instead of 25 gm

"2. *Making of the soil solution.*—In making the soil solution, we wish to get a solution with an end acidity ranging 200 to 1,000 mg. N_2O_5 per liter of the soil solution. The end acidity means the acidity of the soil solution after the solution is ready for the determination of phosphoric acid.

"From the basicity of the soil we can nearly calculate the amount of standard acid wanted for the soil solution, namely:

"(1) If the soil contains practically no traces of carbonates, or the basicity runs below the value of 1,000 mg. N_2O_5, use but 10 cc. of the standard nitric acid solution to 25 gm. of soil.

"(2) If the soil contains carbonates, but the basicity ranges but 1,000 to 4,000 mg. N_2O_5, use just as many cubic centimeters of the standard acid as are required for the full neutralization of the basicity of the soil to 25 gm. of soil.

"(3) If the soil is very much loaded with carbonates or the basicity runs above 4,000 mg. N_2O_5, and the soil is almost loamy or clay, use 5 to 10 cc. less of the standard acid than would be required for the complete neutralization of the basicity. But in the case of sandy and loose peaty soils the author has found it best to use the amount of acid according to (2).

"Now for making the soil solution weigh 25 gm. of air-dried soil in a standard flask of one liter, add about 100 cc. distilled water and standard nitric acid according to the above-detailed rules. With soils rich in carbonates, take care of the effervescence; then fill up to 1,000 cc., close the flask, and put it in a rotary apparatus. After half an hour of slow rotation (one rotation lasting about one-half minute) take out the flask, carefully remove the stopper, and allow the solution to stand at room temperature (12 to 23°) for about 16 hours. Then put the flask again in the apparatus and rotate one-half of an hour again. Now filter the solution and take 25 cc. for the determination of the end acidity of the solution.

"This is done by titrating it with the above-mentioned standard potash solution, using methyl orange as indicator. If the end acidity would not fall between the 200 and 1,000 mg. N_2O_5 as wanted, repeat the preparation of the solution according to the results of the end acidity. If the end acidity is right, the solution is ready for the determination of the phosphoric acid.

"3. *The determination of phosphoric acid in the solution.*—Evaporate 800 cc. of the filtered solution to about 50 cc., using a small amount of a 20 per cent ammonium nitrate solution, for the precipitation of silicic acid. When the solution is evaporated as far as about 100 cc., filter, add 50 to 100 cc. ammonium molybdate solution, heat gently until the precipitation is complete, filter the solution, wash the precipitate with some nitric acid of 5 per cent, dissolve the molybdate precipitate with ammonia, add hydrochloric acid in excess, and again ammonia in excess, and precipitate with the usual magnesia mixture. The small amount of magnesium phosphate precipitates sometimes very slowly and 48 hours should be allowed for complete precipitation. Dry and burn the filter paper in a platinum crucible, ignite, and weigh the magnesium pyrophosphate as usual. The amount of P_2O_5 found, multiplied by 5, gives the per cent in the soil."

A comparison of the results obtained by this method and in fertilizer experiments on 94 Hungarian soils shows a very satisfactory agreement and indicates that the method furnishes a reliable index of the available phosphoric acid in the soil.

On the determination of potash in potash salts and mixed fertilizers by the modified Finkener method, H. NEUBAUER (*Ztschr. Analyt. Chem., 46 (1907), No. 5, pp. 311–314; abs. in Chem. Zentbl., 1907, II, No. 2, p. 182; Analyst, 32 (1907), No. 376, p. 273*).—A recent report by Kling and Engels on tests of the author's modification of this method (E. S. R., 18, p. 108) is referred to and certain improvements of the method, particularly for the determination of potash in mixed fertilizers, are described.

The present form of the author's method for the determination of potash in mixed fertilizers is as follows: Boil 10 gm. of the substance in a 500 cc. flask with about 300 cc. of water, then add a drop of phenolphthalein and sufficient dilute milk of lime to produce a decided red color. After a few minutes add enough oxalic acid to destroy the red color. Cool, fill the flask to the mark, mix, and filter. Evaporate 25 cc. of the filtrate corresponding to 0.5 gm. of substance to dryness in a platinum dish and heat almost to glowing to remove ammonium salts. Take up the residue in water, add a little hydrochloric acid and digest on the water bath with trituration until any floccules of calcium sulphate or silica which may be present are dissolved. Pass through a small filter into a porcelain dish and evaporate with platinum chlorid for determination of potash in the usual way, the reduced platinum being purified by washing with hot 10 per cent nitric acid.

The determination of water in proteids, F. G. BENEDICT and CHARLOTTE R. MANNING (*Amer. Jour. Physiol., 18 (1907), No. 3, pp. 213–221*).—Animal and vegetable proteids are hygroscopic, so it is almost impossible to use anhydrous material for analytical purposes. Accurate determinations of the water content are therefore essential in reporting analyses.

"The usual custom of investigators has been to determine the moisture by heating in an air bath at 110° C., and as the results in this paper show, the determinations thus made may readily be subject to an error of 1 per cent. Obviously an error of 1 per cent or more in the water determinations would result in an error of one-half of 1 per cent in the carbon determinations, and a measurable error in the determination of nitrogen. It can only be said that in the majority of researches on the animal or vegetable proteins, the carbon and nitrogen determinations are in large measure only used for comparative observations, and hence the absolute nitrogen or carbon content is not of as great importance. It is clear, however, that at least so far as the materials used in these investigations are concerned, it is impossible to determine the moisture content in them by drying in hot air at a temperature of 100 to 110°.

"The removal of the final traces of moisture which are persistently retained by the proteins when dried in an air bath at a temperature of 110° can be effected by subsequent desiccation in a high vacuum for 2 weeks."

The detection and estimation of reducing sugars, S. R. Benedict (*Jour. Biol. Chem., 3 (1907), No. 2, pp. 101–117*).—From a study of methods of estimating sugar, the author recommends a copper-carbonate solution and gives directions for its preparation. For delicate work in sugar detection, either in pure solutions or in urine, the reagent should be freshly mixed and diluted.

The method outlined for the volumetric estimation of sugar requires a solution of crystallized copper sulphate in water, a solution of crystallized Rochelle salt with pure anhydrous sodium carbonate, and a solution of potassium sulphocyanid. "For use these solutions are mixed in equal proportions in the order indicated. To every 30 cc. of the solution thus obtained are added from 2.5 to 5 gm. of pure anhydrous sodium carbonate. The amount of this substance added should roughly correspond to the dilution to which the solution will be subjected during the titration, i. e., for titrating dilute sugar solutions add greater quantity of carbonate and vice versa. The solutions are mixed in a beaker of suitable capacity, the requisite quantity of carbonate added, and the mixture heated to boiling over a gauze until the carbonate completely dissolves. Thirty cc. of this mixture (equivalent to 10 cc. copper sulphate solution) are equal to approximately 0.073 gm. of pure dextrose.

"The titration is carried out as follows: The sugar solution is run in from a burette rather rapidly (not so rapidly as to interfere markedly with continuous vigorous boiling) until a heavy, chalk-white precipitate is formed and the color of the fluid begins to lessen perceptibly. The last portions should be run in in quantities of from 2 to 10 drops (depending on depth of color remaining and the relative strength of the sugar solution), with a vigorous boiling of about one-fourth minute between each addition. The end point of the reaction is the complete disappearance of the blue color. This point is sharp and satisfactory. The precipitate obtained is chalk-white and is rather an aid than a hindrance to the determination of the end point."

Separating starch and glycogen, E. Baur and E. Polenske (*Arb. K. Gsndht-samt., 24 (1906), No. 3, pp. 576–580; abs. in Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 2 (1907), No. 2, p. 79*).—In the examination of sausage a method of separating starch and glycogen is desirable, and that elaborated by the author depends upon the fact that glycogen is soluble in a saturated solution of ammonium sulphate, while starch is not. After filtration and dilution the glycogen is precipitated with alcohol. Comparative tests showed that the method gave satisfactory results.

The separation of carbohydrates by means of pure yeasts, J. König and P. Hörmann (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 3, pp. 113–132*).—A summary and discussion of experimental and other data regarding the use of yeast as a means for separating carbohydrates of different sorts. This method is most applicable, according to the authors, when a yeast can be found which has no action upon a given sugar, but attacks other sorts. Since estimating the amount of fermented sugars from loss of weight, as shown by carbon dioxid formed, does not furnish very accurate data, yeasts are especially satisfactory for the separation of glucose and maltose.

The determination of the sugar content of dried beet chips and sugar chips, F. Strohmer and O. Fallada (*Wchnschr. Cent. Ver. Rübenz. Indus. [Vienna], 45 (1907), No. 13, pp. 163, 164*).—A study of the comparative value of methods.

The Polenske number, M. Siegfeld (*Chem. Ztg., 31 (1907), No. 40, pp. 511–513*).—The author has studied the Polenske method of determining the presence of cocoanut oil in butter for a period of 2½ years, and in this article has summarized his results along with those of other investigators.

The Polenske number of the butter fat was increased to some extent by feeding cocoanut cake to cows and to a much greater degree by feeding beet tops and leaves. The author's compilation of 354 determinations of the Polenske number shows variations ranging from 1.20 to 5.30. The addition of considerable cocoanut oil would be required to raise the lowest number to the highest mentioned. It is therefore not believed by the author that the addition of small quantities of cocoanut oil, say 10 per cent, can be detected with certainty in this way. The method, nevertheless, is considered of great practical value.

Distillation device especially for nitrogen determination, C. Block (*Ztschr. Chem. Apparatenkunde, 2 [1907], pp. 46, 47, fig. 1; abs. in Chem. Zentbl., 1907, I, No. 11, p. 781*).—A check bulb through which runs the stem of a thistle tube for introducing alkali for neutralizing the acid in Kjeldahl determinations without danger of loss of ammonia, is described.

METEOROLOGY—WATER.

Treatise on the weather for farmers, P. Holdefleiss (*Witterungskunde für Landwirte. Stuttgart: Eugen Ulmer, 1907, pp. VII+84, figs. 14, charts 6*).—Among the topics discussed in this treatise are the importance of meteorology in agriculture, climate, the importance of weather predictions for the farmer, the making of meteorological observations in agriculture, including observations on rainfall, temperature of the air and of the soil, humidity of the air, winds, clouds, sunshine, atmospheric pressure, weather changes, and phenological studies.

Collected contributions from the field of meteorology and terrestrial magnetism, W. von Bezold and A. Coym (*Gesammelte Abhandlungen aus den Gebieten der Meteorologie und des Erdmagnetismus. Brunswick: F. Vieweg & Son, 1906, pp. VIII+448; rev. in Nature [London], 76 (1907), No. 1958, pp. 28, 29*).—These are the collected works of the eminent late head of the Prussian Meteorological Institute. The subjects treated include the phenomena visible after sunset (*Purpurlicht*); thunderstorms and sunspots; thermodynamics of the atmosphere; temperature and moisture conditions in cyclonic and anticyclonic weather; temperature, pressure, rainfall, cloud and magnetic potential around parallels of the earth; and the Gaussian theory.

Monthly Weather Review (*Mo. Weather Rev., 35 (1907), Nos. 3, pp. 103–154, figs. 10, charts 10; 4 pp. 155–205, figs. 31, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of March and April, 1907, progress of climatology throughout the world, recent papers bearing on meteorology, recent addition to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 3.—Rainfall and Run-off of the Catskill Mountain Region (illus.), by T. Merriman (see p. 11); Variation of Precipitation in the Adirondack Region, by A. J. Henry; The Temperature in the Front and in the Rear of Anticyclones, up to an Altitude of 12 Kilometers, Compared with the Temperature in the Central Area (illus.), by H. H. Clayton; Bright Meteors; International and Local Organizations for the Promotion of Seismology; The Meteor of March 14, 1906, over Central New York, by H. A. Peck; Cooling by Expansion and Warming by Compression, by C. E. Peet; Espy's Nepheloscope; Meteorological Stations in Southern Rhodesia (illus.); A Cloud Bank at Sea; Normals in Weather Bureau Records; A Plea for the Teaching of Meteorology, by R. H. Curtis; On "Absolute" Values; Adam Paulsen (1833–1907); Weather Bureau Men as Educators; and Bells as Barometers.

No. 4.—The Mexican Earthquake of April 15, 1907, with Notes on the Nature of Movements Induced by Earthquakes, by C. F. Marvin; New Japanese Seismological Publications, by C. F. Marvin; Tornado of April 5, 1907, in Escambia County, Fla. (illus.), by W. F. Reed, jr.; A Proposed New Method of Weather Forecasting by Analysis of Atmospheric Conditions into Waves of Different Lengths (illus.), by H. H. Clayton (see p. —); Meteorology in the Physical Laboratory; Action of a Horizontal Air Current upon a Vertical Whirlwind, by B. Brunhes; Characteristics of the Intertropical Atmospheric Circulation; The Velocity of Centers of High and Low Pressure in the United States, by C. F. von Herrmann; A Course in Dynamic Meteorology; Weight of Sleet on Telegraph Wires and Trees; On the Depression in the Value of the Total Intensity of the Solar Radiation in 1903, According to Measurements made at the Central Station of the Polish Meteorological Service at Warsaw (illus.), by L. Gorczynski; The "Southwest" or "Wet" Chinook, by H. Buckingham, sr.; The "Dry" Chinook in British Columbia, by R. T. Grassham; The Wet and Dry Chinooks; The Hurricane of 1867 in the Bahamas; Notes for Teachers; Educational Notes; Weather Bureau Men as Educators; The International Aeronautical Conference of October, 1906, at Milan, by A. L. Rotch; and The Seismological Society of America.

Meteorological observations (*Alaska Stas. Rpt. 1906, pp. 68–75*).—Observations on temperature, precipitation, and cloudiness at Sitka, Kenai, Copper Center, Rampart, and other points in Alaska, are summarized for the latter part of 1905 and most of 1906.

Meteorological observations, J. E. OSTRANDER and T. A. BARRY (*Massachusetts Sta. Met. Buls. 221, 222, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1907. The data are briefly discussed in general notes on the weather of each month.

Weather report for 1906, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 29–31*).—Summaries of observations on temperature, precipitation, and frosts are given for Guelph and other stations in Ontario.

The climate of Calvert County [Md.], C. F. VON HERRMANN (*Baltimore: Johns Hopkins Press, 1907, pp. 167–206, figs. 4*).—The available meteorological data for this county are summarized and discussed.

A proposed new method of weather forecasting by analysis of atmospheric conditions into waves of different lengths, H. H. CLAYTON (*Mo.*

Weather Rev., 35 (1907), No. 4, pp. 161–168, figs. 28).—The more important conclusions reached by the author, after a study of this subject, are as follows:

"(1) That every meteorological element at any given place may be analyzed into a definite number of oscillations or waves differing in length, each of which appears to have a physical existence distinct from that of the others.

"(2) When analyzed in the same way for any given time, the data at widely separated stations near the same latitude show analogous waves, except that the maxima and minima differ somewhat in the time of occurrence at the different stations.

"(3) The waves, at least in temperate latitudes, drift generally from west to east—that is, the maxima and minima occur at eastern stations later than at western stations.

"(4) The velocity of drift is inversely proportional to the wave length. Fluctuations, or oscillations, completed in a short period of time, drift rapidly, while longer fluctuations drift more and more slowly in proportion as the time of oscillation is longer.

"(5) The speed of travel appears to be fairly constant from year to year for waves of the same length of oscillation measured in time.

"The discovery of these facts not merely opens the way to a great improvement in the forecasting of weather from day to day, but also, I believe, furnishes a scientific basis for long-range forecasting. The application of this knowledge to practical work is, however, not easy, because of the difficulty of analyzing and separating the different classes of waves. As a result of working at the matter for a number of years and carefully developing and testing methods of analysis and charting, I believe it is possible to improve the present forecasts and to make forecasts longer in advance, which would be of enormous advantage to agriculture and commerce."

Rainfall and run-off of the Catskill Mountain region, T. Merriman (*Mo. Weather Rev., 35 (1907), No. 3, pp. 109–118, figs. 6*).—This article summarizes the available rainfall data of the region covered by the 4 watersheds proposed to be used as an additional supply for the city of New York, and gives estimates of the probable mean annual rainfall of the watersheds as follows: "Esopus, 44 in.; Schoharie, 41 in.; Rondout, 48 in.; Catskill, 38 in."

Evaporation, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 31, 32*).—This is a continuation of the previous year's work on transpiration (E. S. R., 17, p. 841), and includes a further study of an instrument devised by the author for measuring evaporation. The data reported include observations in the thermometer shelter and at the surface of a reservoir. During the 6 months from June to November, the evaporation from the reservoir was 37.69 in., which is slightly over 10 in. in excess of the mean annual rainfall for the same place.

Damage by lightning in 1906, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 38–40*).—The usual summary of statistics on this subject is given.

Where the wind does the work, C. Cobb (*Nat. Geogr. Mag., 17 (1906), No. 6, pp. 310–317, figs. 10*).—The work of the wind on the low-lying islands and sand reefs of the coast of North Carolina is described, and means of checking the shifting of the sands are discussed.

Analyses of irrigation waters, A. L. Knisely (*Oregon Sta. Rpt. 1905, p. 67*).—Analyses of 5 samples of water used in irrigation experiments reported in Bulletin 86 of the station (E. S. R., 17, p. 90) are given.

Water for various crops, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), p. 33*).—The results of a continuation of measurements of the amount of water required by crops of wheat, barley, oats, and peas are reported.

Underground waters of coastal plain of Texas, T. U. TAYLOR (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 190, pp. 73, pls. 3*).—The region covered by this report, which is based upon data collected by personal visits and correspondence, includes the greater part of the coastal plain of Texas, comprising an area about 150 miles wide bordering the coast and extending across the entire State. Ground water is usually abundant throughout the district, and within recent years artesian wells have been obtained in various parts of the region, some of them furnishing sufficient flow for considerable irrigation. The depth at which artesian water can be obtained varies from a few feet to over 2,000 ft., averaging about 600 ft. The amount of flow varies from 20 to 1,600 gal. per minute.

The geology and water resources of the western portion of the Panhandle of Texas, C. N. GOULD (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 191, pp. 70, pls. 7, figs. 3*).—This report summarizes the results of a geologic and hydrographic reconnaissance made during 1903 and 1905 over a region of approximately 9,360 sq. miles in the western part of the Panhandle of Texas, including Sherman, Moore, Potter, Randall, Dallam, Hartley, Oldham, and Deaf Smith counties. Most of the underground water of this region is derived from the Tertiary deposits. It is almost uniformly soft and relatively pure and suitable for all domestic uses. The local precipitation is apparently the only source of the underground water. It is estimated that only about one-third of the rain sinks into the soil, adding about 18 in. to the ground water each year.

The Potomac River basin, H. N. PARKER ET AL. (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 192, pp. VI+364, pls. 10*).—This report describes all the conditions that affect the economic utilization of the water resources of this basin, dealing with the geographic history, rainfall and stream flow, pollution, occurrence of typhoid fever, character of the water, relation of soils and forest cover to the quality and quantity of the surface water, and the effect of industrial wastes on fishes.

The real cause of the drying up of springs in the basin of the Somme, HOUILLIER (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr. [France], 1906, No. 31, pp. 238–243*).—The various causes which have been observed to contribute to the drying up of springs are briefly discussed, but it is maintained that in the particular case here reported it is not due primarily to diminution of rainfall, destruction of forests, or internal erosion of the soil, but to more complete utilization of the soil for agricultural purposes, resulting in greatly increased evaporation and transpiration through plants.

On the sinking of subterranean waters and the disappearance of springs, E. A. MARTEL (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr. [France], 1906, No. 31, pp. 244–246*).—Brief notes are given on the causes of these phenomena.

The pollution and self-purification of ice (*Mo. Bul. N. Y. Dept. Health, 23 (1907), No. 2, pp. 2–6; abs. in Engin. News, 57 (1907), No. 17, pp. 454–456*).—This article reviews the various causes of pollution and discusses the agencies of self-purification—subsidence and oxidation (destroying 50 to 75 per cent of the bacteria); removal of suspended and dissolved matter by freezing (10 to 40 per cent); freezing (destroying 5 per cent of the bacteria in 1 hour, 90 in 24 hours, and practically all in 2 to 3 weeks); destruction of pathogenic germs when distributed through a large body of water (90 per cent in 30 to 60 days).

"It is thus evident why . . . ice pollution has been robbed of its apparent dangers and why the records show so few, if any, cases of epidemics of typhoid fever due to this mode of transmission. These facts, while emphasizing the great immunity bestowed by nature, point, however, to the real dangers of ice infection with renewed force. There still remains, for instance, the infection due to handling and distribution; to surface pollution due to the pernicious practice of flooding ice to get a thicker crop; to surface pollution due to rains and melting snow washing pollution from side slopes on to ice that has already formed; and, finally, to the dangers of artificial ice when this has been manufactured from contaminated water and delivered to consumers before the natural processes of purification have had an opportunity to become active or effective."

The prevention of stream pollution by strawboard waste, E. B. Phelps (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 189, pp. 29, pls. 2, figs. 2*).—This bulletin describes briefly the manufacture of strawboard and the methods of disposal of the waste liquor from this manufacture, and reports laboratory and field investigations in connection with a manufacturing plant at Urbana, Ohio, on methods of treatment of the waste to prevent pollution of streams.

The results of the experiments show that mechanical filtration through sand without coagulation and a short period of sedimentation remove over 90 per cent of suspended matter and yield an effluent which can be discharged into an equal volume of reasonably pure water without creating a nuisance.

"The sludge resulting from the sedimentation tanks, after pressing or spontaneous drying, is innocuous and makes good soil. It has some value as a fertilizer and is particularly valuable to mix with the clay soils of the Middle West to render them more porous." It is stated that the material contains a considerable proportion of calcium carbonate and 0.34 per cent of available phosphoric acid. "Other uses for this material are suggested, but they require further study."

Report of the commission on sewage irrigation of the city of Paris, Bourneville et al. (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr.* [*France*], *1906, No. 31, pp. 173–180*).—The status in 1905 of the utilization of Paris sewage in irrigation on farms near the city, especially at Gennevilliers, with reference to pollution of the Seine, is briefly reported upon. It is made clear that the constantly increasing volume of sewage can not be cared for by irrigation alone.

Sewage and the bacterial purification of sewage, S. Rideal (*London: The Sanitary Publishing Co., Ltd.; New York: John Wiley & Sons, 1906, 3. ed., pp. XII+355, figs. 58*).—The revision of this third edition consists mainly in the incorporation of recent progress in bacterial methods of sewage disposal and the conclusions of the Royal Commission of Great Britain as far as they have been published (E. S. R., 16, p. 1032).

SOILS—FERTILIZERS.

Further studies on the properties of unproductive soils, B. E. Livingston et al. (*U. S. Dept. Agr., Bur. Soils Bul. 36, pp. 71, pls. 7*).—In continuation of previous investigations (E. S. R., 17, p. 340), studies of the occurrence in unproductive soils of substances deleterious to plant growth have been extended to a number of different soils, and observations have been made upon the effect of organic fertilizers on the toxic properties of soils and on the toxicity of ordinary distilled water.

The soils investigated in addition to the Takoma lawn soil used in previous experiments included a brownish yellow sandy loam subsoil from the Department grounds, Miami silt loam from the Rhode Island Experiment Station farm, and Volusia silt loam from the Ohio Station farm. The methods of investigation were substantially the same as those described in the previous bulletin. The main conclusions drawn from the results of this investigation are summarized as follows: "That toxic substances exist in these soils is apparent from several different lines of evidence. (1) Pure water is uniformly better suited to growing wheat seedlings for short periods than is the soil extract from the poor soils. It is also better suited to the preparation of a nutrient solution. (2) Finely divided, insoluble solids, when shaken with these extracts and then removed by filtering, generally produce a great improvement. Since the only conceivable way in which these can act is through their absorbing action, it is to be supposed that they owe their effect to the fact that they absorb, and thus remove from solution the toxic bodies existing in the extract. (3) The extracts of these soils are benefited by nutrient salts, especially sodium nitrate, but it is pointed out that these may be effective through some other means than the phenomena of nutrition. Certain nonnutrients, such as sodium chlorid, pyrogallol, and tannic acid, produce marked beneficial results. Since these can not act directly through nutrition, they must have some action either upon the toxic bodies, making them nontoxic, or upon the plant, causing it to become more or less immune to the toxic bodies. (4) The same chemicals have similar effects when added to the soil itself. Here the action is more difficult of analysis, but it seems probable that the chemicals act in the same general way as in the aqueous extract.

"The toxic substances here considered appear to be but slightly soluble in water; they are sometimes volatile with steam and sometimes not; the soil extracts containing them are usually more or less acid in reaction, but the acidity is not in itself the cause of their deleterious action; they are probably organic and are absorbed by finely divided solids.

"Evidence is presented to the effect that injurious materials similar to the ones existing in the soils are produced by the growth of wheat in water or sand cultures. Bodies of similar toxic action are also exuded from soaking wheat seeds, and, in some cases at least, may be washed from the bark and leaves of trees."

The experiments on the effect of stable manure and green manure on the toxicity of soils were made on the Takoma lawn soil and on the subsoil from the Department grounds. The results indicate that the beneficial effects obtained from the use of stable manure and green manure "are probably, in large part, due to the organic matters therein contained rather than to the salts carried into the soil by such treatments. That the organic matter is directly of use to plants as nutrient material is not probable; it appears to be beneficial largely through some action upon the soil constituents." It is suggested that the beneficial effects are due to action of the organic matter of the manures in so altering the toxic substances as to render them harmless.

In the course of the experiments referred to above it was found that distilled water, as ordinarily prepared and stored in the laboratory, has a decided toxic action on young plants. Simple redistillation in glass is not sufficient to correct this toxicity. It was found, however, that by shaking the water with finely divided and thoroughly clean carbon black of precipitated ferric hydrate and filtering, the quality of the water in this respect was very greatly improved.

The paraffined wire basket method of soil investigation of the Bureau of Soils, United States Department of Agriculture, C. E. Thorne (*Ohio Sta. Circ. 70, pp. 7*).—The attitude of the Ohio Experiment Station toward conclusions drawn by the Bureau of Soils from work in cooperation with that station by this method is defined in this circular.

Suggestions regarding the examination of lands, E. W. Hilgard (*California Sta. Circ. 25, pp. 7*).—The purpose of this circular is stated to be "to formulate some general explanations on the subject, which may in many cases enable the farmer to come to a definite forecast or conclusion, without individual consultation and advice; or, when this is not attainable, may so instruct him that he can forward to the station such definite statements of facts, and samples properly taken, as will convey the data needful for a full understanding of the situation."

Illinois soils in relation to systems of permanent agriculture, C. G. Hopkins (*Illinois Sta. Circ. 108, pp. 26*).—In this circular the author amplifies his well-known views regarding the maintenance of soil fertility by utilization of the nitrogen of the air through leguminous crops, the liberation of potassium from the soil supply, and the return to the soil of the phosphorus removed by crops, preferably in the form of insoluble phosphates, and explains in some detail the systems of soil management and cropping most likely to secure these results.

Soil surveys, F. B. Guthrie (*Agr. Gaz. N. S. Wales, 18 (1907), No. 5, pp. 438–443*).—This paper discusses briefly the use of soil analysis and more fully "the best means for carrying out a systematic examination of the soils of Australasia, on the lines on which such work is being carried out in other countries, or with such modifications as may be found most suitable to our conditions."

Particular emphasis is laid upon the importance of determining those properties which depend upon the physical character and texture of the soil. The purely chemical analysis is assigned a subordinate position and is limited to determinations of humus, total nitrogen, and of lime, potash, and phosphoric acid soluble in hydrochloric acid, and in special cases in other solvents. It is held that a determination of the rate of nitrification is of the greatest importance, and the method worked out by Ashby (E. S. R., 16, p. 452) and the oxidation method by Russell (E. S. R., 17, p. 536) are suggested for trial in the absence of any well-established method for this purpose.

Agricultural charts and the analysis of soils, A. Grégoire (*Bul. Soc. Chim. Belg., 21 (1907), No. 4, pp. 153–166*).—The author lays great stress upon the importance of the study of geological conditions and processes, and much less upon chemical analysis.

The agricultural value of the soils of central and western Africa, A. Hébert (*Quinz. Colon., 11 (1907), No. 4, pp. 131–135*).—The soils of this region are described on the basis of data secured by examinations of representative samples collected by Chevalier in his expeditions to the Lake Tchad region, French Guiana (E. S. R., 18, p. 426), the Island of St. Thomas, and the Gold Coast (E. S. R., 18, p. 532).

The soils of the Lake Tchad region are shown to be in general very sandy, very poor in phosphoric acid and potash, and particularly deficient in lime, but rich in sodium salts. The similarity in essential characteristics of the soils from different parts of the region indicates that they are of common origin and that the region was originally the bed of an inland sea, all of which, except Lake Tchad, has disappeared by evaporation.

The soils of the other regions show the same deficiencies as those of the Lake Tchad region.

In spite of the great deficiency, and in some cases almost total lack of potash, phosphoric acid, and lime in the soils of central and western Africa, the indigenous plants, including among others coffee (*Coffea excelsa*), cotton (*Gossypium anomalum*), and cacao, are able to assimilate the considerable amounts of these constituents needful for their vigorous growth. A direct connection between the deficiency of lime and the characteristic desert conditions of Sahara is traced.

The fertility of some colonial soils, as influenced by geological conditions, C. F. Juritz (*Agr. Jour. Cape Good Hope, 30 (1907), No. 4, pp. 454–476*).—Studies which have been carried on during the past 7 years in the government analytical laboratory of the Cape of Good Hope on soils from the southwestern districts of the colony are summarized. The averages for the various soil types are given in the following table:

Average results of chemical analyses of Cape of Good Hope soils.

Geological formation.	Number of soils analyzed.	Water.	Lime.	Potash.	Phosphoric acid.
Pre-cape rocks:		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Malmesbury series	14	0.94	0.039	0.039	0.039
Granite	9	1.19	.049	.069	.048
Campbell Rand series	7	3.99	4.169	.048	.057
Olive shales	21	2.08	.310	.067	.061
Cape system:					
Table Mountain series	46	1.08	.034	.031	.036
Bokkeveld series	18	1.27	.387	.231	.118
Common horizon of Table Mountain and Bokkeveld series	11	.98	.042	.141	.075
Witteberg series	4	3.49	.051	.058	.065
Karoo system:					
Dwyka series	2	2.44	1.013	.188	.059
Burghersdorp beds and Stormberg series	24	4.29	.233	.172	.078
Cretaceous system:					
Uitenhage series	21	1.44	.299	.181	.087
Recent deposits:					
Sand downs	2	....	.078	.080	.027
Alluvial silts and river deposits	11	2.86	.584	.153	.106

On the alkali soils of Middle Hungary, A. von Sigmond (*Wiener Landw. Ztg., 55 (1905), pp. 628, 629; abs. in Zentbl. Agr. Chem., 36 (1907), No. 2, pp. 133, 134*).—The origin and character of these soils are discussed.

Notes on some Java soils, W. Detmer and H. Immendorff (*Botanische und landwirtschaftliche Studien auf Java. Jena: Gustav Fischer, 1907, pp. 26–36*).—Chemical analyses and clay content of samples of soil and subsoil from cacao, cinchona, and tea plantations are compared with analyses of representative German soils. The most notable feature of these analyses is the high percentage of fertilizing constituents in the (good) tea soil (0.56 per cent of nitrogen, 0.16 per cent of phosphoric acid, 0.24 per cent of potash, and 0.66 per cent of lime).

Soils of Cambridgeshire, F. W. Foreman (*Jour. Agr. Sci., 2 (1907), No. 2, pp. 161–182*).—Physical and chemical analyses of typical soils of this district are reported. These analyses show in general a close relation between the mechanical and chemical character of the soils and the underlying formations.

Analyses of soils from old apple orchards, A. L. Knisely (*Oregon Sta. Rpt. 1905, pp. 65, 66*).—Analyses of samples of soil from old orchards and from adjacent fields, made with a view to determining whether the failure of such orchards is due to exhaustion of potash, are reported. The results show that the average potash content of the orchard soils (0.22 per cent) was not materially different from that of the adjacent fields (0.23 per cent). The author, therefore, concludes that "the stunted growth, lack of vigor, etc., are due much more to neglect than to a deficiency of plant food in the soil."

Soils of the Abitibi district, R. Harcourt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 58–62*).—Analyses are reported of 18 samples of soil from this region, which occupies that part of the districts of Algoma and Nipissing lying between latitudes 49 and 51° N.

The results show that none of the soils are likely to be deficient in lime and most of them are abundantly supplied with it. The larger proportion of the soils is well supplied with potash and phosphoric acid. The nitrogen content is, as a rule, very low for soils which have never been cropped. The humus content is generally large, but it is evident that the decomposition of the organic matter has not yet proceeded very far.

From the results as a whole the general conclusion is drawn that "where drainage and cultivation receive due attention, much of the soil in the Abitibi district possesses sufficient plant food to grow many remunerative crops."

Soil analysis, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 35, 36*).—Mechanical analyses of 20 samples of soil from one farm are reported.

Soil acidity in its relation to lack of available phosphates, A. R. Whitson and C. W. Stoddart (*Jour. Amer. Chem. Soc., 29 (1907), No. 5, pp. 757–759*).—This is a preliminary report on investigations more fully presented elsewhere (E. S. R., 18, p. 1024).

Some mutual effects of tree-roots and grasses on soils, C. A. Jensen (*Science, n. ser., 25 (1907), No. 648, pp. 871–874*).—Data are presented which lead to the conclusion "that seedling trees of tulip, dogwood, maple, cherry, and pine retard growth of wheat when the latter is grown under conditions making it necessary for the wheat roots to be in close physical relation with the tree roots; that this retarding effect differs with different species of tree seedlings; that the checking of wheat growth is greatest during the season when the tree seedlings are most active physiologically, and this checking effect becomes less as the season of physiological inactivity of the trees is approached. That in the case of pine, at least, the live pine is much more detrimental to wheat growth than the dead pine.

"This injurious effect of trees on wheat appears to be due to the excretion of substances by the trees toxic to wheat growth."

Marly subsoils and the chlorosis or yellowing of citrus trees, E. W. Hilgard (*California Sta. Circ. 27, pp. 4*).—Cases of injury to citrus trees from calcareous subsoils are cited as an illustration of the necessity of carefully studying subsoils before planting orchards, and attention is called to the relation between native vegetation and the character of soil and subsoil as furnishing a practical means of judging soil conditions.

Treatment of peat soils, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 33–35*).—In continuation of experiments of the previous year (E. S. R., 17, p. 841), the effect of mixing various proportions of loam, lime, sand, and marl with peat was studied. It was found that peat treated with a moderate application of loam gave the best yield in both grain and straw of oats. Marl and lime were also beneficial, but sand was not.

Aeration of soils, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 36, 37*).—The effect of forcing air once a day through 4-gal. crocks of peat soil, in which wheat, barley, oats, peas, alfalfa, and soy beans were grown, are reported. The aerated wheat and barley did not seem to do quite as well as the unaerated. The other crops were, as a rule, benefited by aeration.

Soil temperatures (*Alaska Stas. Rpt. 1906, pp. 67, 68*).—Daily observations of temperature at 6 in. and 2 ft. below the surface of the ground and at 6 in. above, at Sitka, from May 20 to October 12 and at Kenai from May 17 to September 30, 1906, are recorded.

Seed inoculation, D. Finlayson (*Country Life [London], 21 (1907), No. 529, pp. 257–259, figs. 8*).—The history of investigation on this subject is briefly reviewed and experiments by Professor Bottomley, of Kings College, are reported. It is stated that 90 per cent of the 200 tests made with Professor Bottomley's cultures in different parts of Great Britain were successful. Some of the causes of failure are explained.

Commercial cultures of Pseudomonas radicicola, H. A. Harding and M. J. Prucha (*Abs. in Science, n. ser., 25 (1907), No. 647, p. 818*).—This is an abstract of a paper presented at the eighth annual meeting of the Society of American Bacteriologists, giving results of further tests by the New York State and other stations of commercial cultures of this organism dried on cotton, which have generally given unsatisfactory results. The use of metal containers to preserve the vitality of the cultures has been found ineffective.

On changes in a light sandy soil by sterilization, A. Koch and G. Lüken (*Jour. Landw., 55 (1907), No. 1, pp. 161–172*).—Observing that oats made much better growth on a sandy soil which had been sterilized than on one which had not been so treated, the authors made a study of the soil to determine the cause of the increased productiveness of the sterilized soil. It was found that the sterilized soil contained much more water-soluble organic matter and nitrogen than the unsterilized soil, while hydrochloric acid of 1.026 specific gravity dissolved 10 per cent of the total nitrogen of the sterilized soil as against 5 per cent of that of the unsterilized soil.

The authors, like other investigators, observed an injurious effect during the early periods of growth on the sterilized soil. These effects were observed first in zinc pots, but were afterwards noted in case of clay pots, especially when experiments were started in the spring. When the planting was done in early summer the higher temperatures apparently overcame any such injurious effects. The addition of calcium carbonate did not prevent injurious effects.

On new principles in soil studies, H. R. Christensen (*Tidsskr. Landbr. Planteavl, 13 (1906), pp. 145–198*).—A lecture delivered in the Royal Danish Agricultural Society, March 28, 1906, containing also a report on investigations on the occurrence and distribution of *Azobacter chroococcum* in Danish soils.—F. W. Woll.

Movements of certain bacteria in soils, K. F. Kellerman and Edna H. Fawcett (*Abs. in Science, n. ser., 25 (1907), No. 647, p. 806*).—The following abstract is given of a paper presented at the eighth annual meeting of the Society of American Bacteriologists:

"Two organisms have been studied in connection with *Pseudomonas radicicola, Bacillus ochraceous* and a form resembling *Bacillus coli*. The latter kills *Pseudomonas radicicola* when in synthetic nitrogen-poor sugar bouillon, but not in soil extracts of favorable soils; *Bacillus ochraceus* has little effect upon *Pseudomonas radicicola* under either condition.

"In sterilized favorable soils saturated with water *Bacillus ochraceus*, *Pseudomonas radicicola*, and the paracolon organism grow with almost equal speed, progressing about 1 inch in 48 hours. In soils barely moist *Pseudomonas radicicola* progresses at the rate of about 1 inch in 72 hours, while the two other forms are reduced to a rate of about 1 inch in 8 days. These experiments were all conducted at a temperature of 25° C. At a temperature of 10° C. the rate of *Pseudomonas radicicola* was reduced to 1 inch in 3 days in saturated soil; the two other organisms had made practically no growth at the end of 30 days.

"Under none of the conditions of these experiments did there seem to be any antagonism in the soil between *Pseudomonas radicicola* and *Bacillus ochraceus* or the paracolon organism."

The electro-chemical and electro-metallurgical industries in 1906, J. B. C. Kershaw (*Sci. Amer. Sup., 63 (1907), No. 1629, pp. 26098, 26099*).—This is a reprint of an article giving a brief review of the progress in these lines during the year. The part of particular interest from an agricultural standpoint is that relating to the development of processes for the manufacture of nitrogen compounds. The establishment of factories in Norway, Germany, Switzerland, France, and Italy for the manufacture of nitrogen compounds by either the Birkeland and Eyde or the Frank and Caro method is noted.

The utilization of atmospheric nitrogen for industrial purposes, P. F. FRANKLAND (*Jour. Soc. Chem. Indus., 26 (1907), No. 5, pp. 175–180, figs. 3*).—Various processes which have been proposed for this purpose are described.

Experiments with lime nitrogen, nitrate of soda, and sulphate of ammonia, E. WEIN (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 13, pp. 128–134*).—Comparative tests of these fertilizers on barley, oats, and potatoes.

The movement of ammoniacal nitrogen in nature, P. EHRENBERG (*Mitt. Landw. Inst. Breslau, 4 (1907), No. 1–2, pp. 47–300, pls. 2, figs. 3*).—This is a critical monograph on this subject, including a very complete review of literature. It deals with the evaporation of ammonia from water, decomposing organic solutions and solids, soils, and ammoniacal substances spread on soils; the leaching out of ammonia; the transformation of ammonia into free nitrogen and nitric acid (nitrification); the chemical fixation of ammonia in soils and outside of them; the physical fixation of ammonia; the fixation of ammonia by lower plants; the taking up of ammonium compounds by higher plants; and the fixation of ammoniacal nitrogen by animals.

A series of experiments made with specially constructed apparatus to measure the amount of ammonia given off by soils with and without addition of ammoniacal compounds when a current of air is swept over them at uniform normal temperature (19–20°) is reported.

The conclusion is reached that only in case of sandy soils rich in calcium carbonate and poor in zeolithic compounds and humus is loss of ammonia by evaporation to be feared. Even in this case such loss occurs only when the summer temperature is very high, the soil dry, and the soil content of ammonia large, as in case of heavy applications of nitrogenous fertilizers. Practically, therefore, the loss from this source is insignificant.

In a series of pot experiments to study the question of assimilation of ammoniacal nitrogen by higher plants, the conclusion was reached that only nitric nitrogen is suited to the needs and will insure a normal development of the ordinarily cultivated higher plants. The assimilation of ammoniacal nitrogen assumes appreciable importance only in case of acid-soil and swamp-land plants.

Nitrogenous fertilizers, L. H. MANSHOLT (*Cultura, 19 (1907), No. 224, pp. 260–266*).—Comparative pot tests on oats of nitrate of soda, lime niter, and nitrogen-lime are reported.

Phosphates and phosphorus (*U. S. Geol. Survey Bul. 315, pp. 449–484, figs. 3, map 1; Amer. Fert., 26 (1907), Nos. 3, p. 21; 5, p. 17; Engin. and Min. Jour., 83 (1907), No. 25, p. 1191*).—The following papers on this subject are given in Contributions to Economic Geology, 1906, part 1, the first two being briefly noted in the other references given:

Phosphate deposits in Western United States, F. B. Weeks and W. F. Ferrier (pp. 449–462, figs. 3, map 1).—An account is given of the discovery, extent, and character of important oolitic deposits of phosphate in southeastern Idaho, southwestern Wyoming, and northeastern Utah. The deposits consist of alternating layers of black or brown phosphate, shale, and hard blue or gray compact limestone, mainly fossiliferous. The main bed so far developed is from 5 to 6 ft. thick and contains on an average 32 per cent of phosphoric acid.

Developed phosphate deposits of northern Arkansas, A. H. Purdue (pp. 463–473).—This is a brief account of the discovery, location and development, and character and extent of these deposits, a report on which by the Arkansas Station has already been noted (E. S. R., 14, p. 430). "While it is known that there is a phosphatic horizon of wide extent in northern Arkansas, the deposits have been developed at only one place, viz, on Lafferty Creek, in the western part of Independence County. . . . The developed deposits occur between the Polk Bayou Limestone and the St. Clair marble. . . . The phosphate rock is of sedimentary origin, and where developed is light-gray, homogeneous, and conglomeratic, the pebbles being the size of peas and smaller." Analyses are reported which show that the better specimens of the phosphate contain as high as 32 per cent of phosphoric acid.

Phosphorus ore at Mt. Holly Springs, Pa., G. W. Stose (pp. 474–483).—A deposit of wavellite (aluminium phosphate) at this place is described and its use for the manufacture of phosphorus is discussed.

Geological Survey publications on phosphates and other mineral fertilizers (p. 484).—A list of 20 publications on this subject is given.

On the changes which acid phosphates undergo under pressure or mechanical deformation, W. Spring (*Bul. Soc. Chim. Belg., 21 (1907), No. 3, pp. 91–103; Acad. Roy. Belg., Bul. Cl. Sci., 1907, No. 3, pp. 193–211*).—It was observed that the primary phosphates undergo a certain amount of decomposition under pressure or mechanical deformation, resulting, first, in the elimination of water of hydration and, finally, in the liberation of a certain quantity of phosphoric acid. The general effect is to facilitate reversion in certain phosphates. The primary phosphates of calcium, sodium, and probably lithium form molecular combinations with their respective sulphates. In the case of calcium compounds this molecular combination is apparently insoluble in water and its formation, therefore, contributes to the reversion of the acid phosphates of calcium.

The influence of phosphates on the circulation of potash in soils, C. Schreiber (*Rev. Gén. Agron., n. ser., 2 (1907), No. 3, pp. 97–110*).—Pot experiments with monocalcium phosphate and phosphatic slag on oats are reported from which the conclusions are drawn that both monocalcium phosphate and Thomas slag convert insoluble compounds of potash in the soil into soluble forms, the action of the Thomas slag in this respect being somewhat inferior to that of monocalcium phosphate. While the amount of potash thus set free in these experiments was considerable, it was not sufficient to render the use of potassic fertilizers unnecessary. It was found also that small applications of lime by setting free potash in the soil increased the effect of the phosphate. In large applications, however, lime rendered the phosphoric acid insoluble and depressed the yield in case of both monocalcium phosphate and slag, but less in case of slag than of superphosphate.

Algerian and Tunisian phosphates in 1906, Maizières (*Engrais, 22 (1907), No. 9, pp. 205–207*).—Statistics of the exploitation of these phosphate deposits are given.

Researches on glauconite, L. W. Collet and G. W. Lee (*Proc. Roy. Soc. Edin., 26 (1905–6), No. 4, pp. 238–278, pls. 12, map 1*).—This is a very complete study of the mineralogical character, physical properties, chemical composition, formation, association with phosphoric concretions, and distribution of this potassic silicate, which is of considerable agricultural importance in connection with deposits of phosphates and green sand marl. The article is in French.

A bibliography of 43 references to literature on the subject is given.

The use of potash salts on different soils and crops, Densch (*Illus. Landw. Ztg., 27 (1907), No. 11, pp. 83–85*).—This is a brief discussion of the adaptability of potash salts to different soils and crops.

Commercial fertilizers, W. J. Jones and O. C. Haworth (*Indiana Sta. Bul. 121, pp. 463–538, map 1*).—This bulletin summarizes the main provisions of the Indiana fertilizer law, discusses briefly the results of inspection, and gives in tabular form the analyses of 879 samples of fertilizers inspected during 1906. The large percentage of samples examined which were below the guarantee in composition indicates "a condition as regards mixing and composition which is far from what it should be."

Analyses of commercial fertilizers (*Kentucky Sta. Bul. 128, pp. 173–258*).—Analyses and valuations of 651 samples of fertilizers collected during 1906 are reported in tabular form, with brief explanatory notes.

Trade values and fertilizer and soil analyses, C. A. GOESSMANN and H. D. HASKINS (*Massachusetts Sta. Bul. 117, pp. 22*).—This contains a statement of trade values for 1906 and 1907, instructions regarding sampling, and analyses of miscellaneous samples of fertilizers, soils, etc., sent to the station for examination.

Inspection of fertilizers in 1906, F. W. MORSE (*New Hampshire Sta. Bul. 130, pp. 8*).—This bulletin reports the results of analysis of 114 samples of fertilizing materials inspected during the year.

[**Analyses of garbage ashes**], R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), p. 56*).—An analysis is reported of a sample of ashes from the garbage disposal plant of Toronto, which contained 6.5 per cent of lime, 1.9 per cent of potash, and 2.7 per cent of phosphoric acid.

Odorless fish fertilizer (*Amer. Fert., 26 (1907), No. 5, p. 13*).—It is stated that H. G. Deming, of the State University of Washington, has devised a process for preparing such a fertilizer, thus offering a means of saving the large amount of fish refuse which now goes to waste.

Mineral resources of the United States, calendar year 1905, D. T. DAY (*U. S. Geol. Survey, 1906, pp. 1403, fig. 1*).—Among the materials of special agricultural interest of which statistics of production and consumption are given as usual are lime, gypsum, marl, phosphate, potassium salts, and peat.

The fertilizers and feeding stuffs act of Great Britain (*Mark Lane Express, 96 (1907), Nos. 3928, p. 2; 3929, pp. 27, 28; 3930, p. 51; 3931, p. 85*).—The more important features of this act and of the rules and regulations adopted by the board of agriculture are summarized and explained.

The act requires the dealer to give the purchaser an invoice showing the percentages of nitrogen, soluble phosphates, insoluble phosphates, and potash in fertilizers. Cattle or poultry foods must be properly described by invoice according as they are prepared from one or more than one substance or seed, and if the food is artificial, percentages of oil and albuminoids must be stated. Such invoices are to be regarded as warranties, and advertisements and circulars containing statements regarding the character of the fertilizers or feeding stuffs are also to have the effect of warranties. Penalties for violations of the act are fines of from $50 to $250. The board of agriculture will have charge of the administration of the act through a chief agricultural analyst. (E. S. R., 18, p. 433.)

The fertilizers and feeding stuffs regulations, 1906 (*Jour. Bd. Agr. [London], 13 (1907), No. 10, pp. 604–615*).—The general regulations and those regarding sampling and limits of error agreed upon by the board of agriculture under the new fertilizer and feeding stuffs act are given.

The fertilizers and feeding stuffs act, J. A. VOELCKER (*Mark Lane Express, 96 (1907), Nos. 3935, p. 210; 3936, p. 241*).—The act is explained.

AGRICULTURAL BOTANY.

A contribution to the knowledge of correlation in plant metabolism, B. HANSTEEN (*Landw. Jahrb., 36 (1907), No. 2, pp. 267–308*).—The author has sought to ascertain the correlation between the phosphoric acid, magnesia, and potash taken up by plants at different stages of growth. About a dozen species of plants representing 5 different orders were studied and the phosphoric acid, magnesia, and potash content of roots, stems, cotyledons, endosperm, etc., were determined. The results of the analyses were discussed at length, the analytical data being given in detail.

The influence of light during germination on the assimilation of organic reserve material in seeds and bulbs, W. Lubimenko (*Compt. Rend. Acad. Sci.* [*Paris*], *144* (*1907*), *No. 19, pp. 1060–1063, dgm. 1*).—Wheat, oats, peas, white lupines, maize, and onions were grown under bell jars and the amount of light was regulated by covering the glass with varying thicknesses of white or black paper. The total growth, length, fresh and dry weight, etc., of the plants in each series was ascertained. The weight for the dry plants, grown under the different lights and intensities, is shown by curves from which it appears that while the water content varied but slightly, the dry weight of the different plants varied widely, depending upon the amounts of illumination.

The wheat, maize, pea, and onion plants increased in dry weight with increased illumination up to a maximum which about corresponded with the amount of light necessary for the beginning of chlorophyll formation. The dry weight of the wheat, peas, and onions grown in diffused light was greater than when grown in partial shade, but with maize, white lupines, and oats the dry weight was greatest for those plants grown under less light, and for lupines and oats the maximum dry weight was correlated with a minimum of light. The author concludes that the assimilation of reserve material stored in seeds and bulbs is influenced by the amount of light and that assimilation attains its maximum at about the amount of illumination required for the formation of chlorophyll. An increased illumination beyond this optimum is followed by diminished assimilation.

The development of chlorophyllous plants in the absence of carbon dioxid but with nontoxic quantities of amids, J. Lefèvre (*Rev. Gén. Bot.*, *18* (*1906*), *Nos. 208, pp. 145–163, fig. 1; 209, pp. 205–219; 210, pp. 258–280, figs. 4; 211, pp. 302–310*).—A series of experiments was conducted with cress and sweet basil grown in pots under bell jars without carbon dioxid but in the presence of a number of amids. The plants were supplied with chemical fertilizers to which was added a mixture of tyrosin, oxamid, glycocoll, alanin, and leucin at the rate of 1.1 gm. for every 500 gm. of soil.

The plants were observed under conditions of light and darkness, and it was found that in the presence of sunlight they were able to make considerable growth, attaining in 6 weeks a size fully 10 times that of the original, and with well-developed foliage and flower buds. As this growth took place in the entire absence of carbon dioxid, the carbon required must have come from the amids and was taken up by the roots. That the transfer was not simply osmotic, but true synthesis, is shown by the absence of all, or nearly all, growth when the plants were kept in the dark. Apparently photosynthesis took place in almost normal amount.

Carbonic acid assimilation and chlorophyll function, F. G. Kohl (*Ber. Deut. Bot. Gesell.*, *24* (*1906*), *Generalversammlungs-Heft, pp. 39–54*).—A résumé is given showing the present status of our knowledge relating to the assimilation of carbon dioxid and the chlorophyll function of plants.

The function of invertase in the formation of cane and invert sugar dates, A. E. Vinson (*Bot. Gaz.*, *43* (*1907*), *No. 6, pp. 393–407*).—In the studies made at the Arizona Experiment Station on the ripening of dates, the author has found that different varieties of these fruits have decidedly different chemical composition and that there appear to be well-established chemical mutants among date palms. These mutants originated long ago and are perpetuated by suckers. Whether they will transmit their differences through seedlings remains to be demonstrated.

In addition to the physical classification into hard and soft dates they may also be grouped into cane and invert sugar dates, the lines of the latter crossing those of the former, as the Deglet Noor is a typical cane sugar date, yet decidedly a soft one. The M'Kentichi Degla is a cane sugar date of the hard class. On the other hand, Saffraia, a typical hard date, is also an invert sugar date, and Halloui is a hard but only a partial cane sugar date.

Detailed studies were made of the variety Deglet Noor, a cane sugar date and a seedling invert sugar variety. It was found that the Deglet Noor shows an inclination toward cane sugar even in early stages, but from this point on it gains chiefly in cane sugar until ripeness is approached, when invert sugar takes its place. The amount of inversion seems to be influenced by the temperature to which the ripening date is subjected. The invert sugar date shows an increase parallel to the increase in dry matter. During the period of maximum ripening, when dry matter is accumulating very rapidly, cane sugar appears in considerable quantities. This is attributed to the formation of cane sugar at a greater rate than the invertase is capable of inverting it. Many varieties of dates have been examined and cane sugar is found to accumulate just before the softening of the fruit. At this time the invertase is readily extracted by solvents. The difference in behavior of the 2 classes of dates during ripening is believed to be due to the presence or absence of invertase.

The influence of tension on the formation of mechanical tissue in plants, R. P. Hibbard (*Bot. Gaz., 43 (1907), No. 6, pp. 361–382*).—The author conducted a series of experiments with sunflowers, beans, castor beans, cabbage, coleus, fuchsia, and vinca, subjecting the plants to tension and compression to determine the effect of these stimulants on the mechanical tissue. Contrary to the results by other investigators, but slight effects were noticed.

Of the stems tested for the increase of mechanical tissue under the influence of longitudinal pull, only that of vinca showed a response, and in this the increase was not great. Pull in the direction of the longitudinal axis of the plant caused a small increase in the tissue of the main and lateral roots of sunflowers and castor beans. Compression tension brought small increases of the mechanical tissue in the stems of fuchsia, vinca, and helianthus, but coleus gave no response.

Selection breeding of self-fertile plants, C. Fruwirth (*Arch. Rassen u. Gesell. Biol., 4 (1907), Nos. 2, pp. 145–170; 3, pp. 281–313*).—After describing various methods of breeding agricultural plants, their variability and powers of transmission of characters, the author reviews the results obtained by a number of investigators in selection and breeding. This is followed with detailed accounts of experiments conducted on the selection, breeding of peas, barley, oats, etc.

Concerning the self-sterility of some flowers, L. Jost (*Bot. Ztg., 1. Abt., 65 (1907), No. 5–6, pp. 77–117, pl. 1*).—Studies were made of a number of species of plants, among them *Corydalis cava*, *C. lutea*, *Secale cereale*, *Lilium bulbiferum*, *Hemerocallis flava*, *Cardamine pratensis*, *Cytisus* sp., and *Lupinus albus*, to determine the causes of the sterility of the flowers to their own pollen. The investigations included studies of pollen, structure of styles and stigmas, growth of pollen tubes in artificial solutions, in styles, etc.

A list of titles to the more important literature of the subject is given.

Notes on xenia, E. A. Bunyard (*Report of the Third International Conference, 1906, on Genetics. London: Roy. Hort. Soc., 1907, pp. 297–300*).—The author reports observations on xenia, or the influence of foreign pollen upon the maternal structure, and gives an account of experiments with maize, beans, peas, peaches, apples, etc. So far as his experience goes, he says that the occurrence of xenia as an influence of the pericarp is very rare, and that considerably more experimentation is needed to establish the phenomena on a firm basis of positive fact.

The occurrence of formaldehyde in plants, S. Nizza (*Malpighia, 20 (1906), No. 8–9, pp. 395–405*).—A considerable number of herbaceous and ligneous plants were tested by different methods to determine the presence of formaldehyde. It is claimed that Pollacci in 1899 showed that the presence of formaldehyde in plants was not due to the chlorophyll activity of the plant and was independent of solar energy. As a result of his studies, the author concludes that formaldehyde exists in the woody part of plants and its abundance is in proportion to the development of ligneous tissue. It is not found in the green parts of the plant, and its formation is independent of the presence of light or of the assimilatory processes of the plant. Formaldehyde is considered by the author to be an integral part of the woody tissues of plants and it is believed to originate in those tissues.

The recognition of glucosids in plants by means of emulsin, E. Bourquelot (*Arch. Pharm., 245 (1907), No. 3, pp. 172–180*).—A report is given of the examination of about 50 species representing 7 or 8 families of plants, to determine the presence of glucosids. Fresh and dried portions of plants were used. By the addition of emulsin to the macerated material and examination with the polariscope, the occurrence of glucosids was determined.

Linamarin, a cyanogenetic glucosid of flax, A. Jorissen (*Acad. Roy. Belg., Bul. Cl. Sci., 1907, No. 1, pp. 12–17*).—In this communication the author calls attention to a publication in which he announced in 1884 the presence of a cyanogenetic glucosid in flax to which he gave the name linamarin.

FIELD CROPS.

Annual report of Alaska Agricultural Experiment Stations for 1906 [Field crops], C. C. Georgeson (*Alaska Stas. Rpt. 1906, pp. 38–50, pl. 1*).—Brief notes are given on the crops grown at the various stations during the year.

Work at the Copper Center Station, J. W. Neal.—This station has now about 40 acres under cultivation and 80 acres of fenced pasture land. Alsike clover, alfalfa, *Agropyron tenerum*, *Festuca elatior*, *Holcus lanatus*, redtop, orchard grass, timothy, Essex rape, and *Bromus inermis* were grown in 20 by 60 ft. plats on a tract of heavy moist soil. Alsike clover and alfalfa did not give good results. *Agropyron tenerum* made a growth of 20 in. during the season and seemed very promising. Timothy also made a good growth and a yield of hay, amounting to 6,114 lbs. per acre, was secured. *Bromus inermis* was found valuable for spring pasture, but not profitable as a hay crop.

None of the different varieties of wheat grown matured seed. A better growth was secured on new ground summer-fallowed and fertilized with guano at the rate of about 400 lbs. per acre than on old ground cropped the year before without the use of fertilizer. In many instances the crop reached a height of 50 to 52 in.

Barley also grew best on the fertilized plat summer-fallowed. Grain was matured on only one well-protected plat. On other plats the crop was killed by frost August 24. Chevalier, Champion, Mansbury, and Odessa were apparently earlier than other varieties. On the best plats the crop stood from 40 to 45 in. high.

On light, dry soil in a protected location a small amount of oats matured. Finnish Black, Banner, Burt Extra Early, and Swedish Select were ripe enough to cut September 5 and 290 lbs. of seed were secured. Burt was the latest of these varieties, and Sixty-Day, which was still later, was nearly all killed by frost. Finnish Black on the summer-fallowed plat reached a height of from 50 to 58 in.

S. P. I. No. 11268 rye made a fine crop of hay from spring seeding, but did not proved to be a winter variety as is claimed. A fair stand of Amber rye lived through the winter and a few heads matured seed. Several varieties of winter wheat and rye were winterkilled.

Work at the Rampart Station, F. E. Rader.—At this station rye has never failed to winter successfully since 1900. This year Amber winter rye grew to an average height of 48 in. and produced short but well-filled heads, with plump grain. Giant French and Excelsior winter rye also gave good results. Kharkov winter wheat did much better than the year before and seemed more promising. Part of it was cut September 5 and the rest September 10.

The spring grains grown were barley, wheat, oats, rye, and buckwheat. These were sown the last days of May. Mansbury barley produced fine large heads and was harvested September 15. Lapland also grew well and ripened a little earlier than Mansbury. Two-rowed barley was ripe for cutting September 12. Saskatchewan Fife wheat did not develop further than the dough stage, and spring rye also failed to mature. Burt Extra Early oats ripened from September 1 to 15, when it was harvested, but the variety is not considered very desirable on account of its short, fine straw and small heads. Finnish Black oats is a tall variety with a large head and considered very desirable for that latitude if it can be made to mature earlier. Russian buckwheat was killed by frost August 25, when one-fourth of the crop was ripe. Early Rose potatoes, planted with the sprouts on the tubers, produced the largest tops and the most matured potatoes and yielded nearly twice as much as ordinary planting. Burbank from Rampart-grown seed grew well and produced good-sized tubers, the average yield being altogether about tenfold, and the quality good.

Of the different grasses under test, redtop, orchard grass, timothy, and velvet grass made the best growth.

Work at the Kenai Station, P. H. Ross.—Oats were grown for stock feed and made into hay when the grain was in the milk. A rank heavy growth was secured on an area treated with barnyard manure the year before, while on ground not so fertilized the growth was much lighter and thinner. Tall fescue, redtop, timothy, and meadow foxtail seeded in 1903 were cut for hay August 24, but no seed had ripened. Of the grasses seeded in 1904, tall fescue and tall oat grass were 40 in. high and blue grass 36 in. high on August 15. Smooth brome grass, hitherto one of the most thrifty grasses, did not grow well on account of the wet season. Of the grasses seeded in 1905, bluetop was from 48 to 60 in. high on August 15, bunch grass 30 in., timothy 40 to 60 in., and tall fescue 36 in. Bluetop, timothy, and bunch grass matured seed on soil well fertilized with barnyard manure. It was found that timothy needs barnyard manure as a soil dressing to make a good growth.

[Report of the] professor of field husbandry and experimentalist, J. BUCHANAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 164–176, 178–192*).—After giving a general outline of the work in his department, the author reports the results of experiments with a large number of different field crops. Practically all of the work reported is in continuation of previous investigations (E. S. R., 17, p. 851).

A comparison of different grain crops in progress for the past 5 years shows that the greatest yield of grain per acre, 2,739 lbs., was produced by barley, being followed by emmer with 2,714 lbs. In this same test the smallest yields by weight were produced by grass peas and spring vetches, the yields per acre amounting to 814 and 713 lbs., respectively.

A comparison of large, medium, and small-sized seeds of cereals, roots, and rape show that the large seeds surpassed the small seeds by 19.1 per cent for the cereal crops, 60.1 per cent for the root crops, and 40.3 per cent for the rape. The average of all results with plump and shrunken seeds of barley, spring wheat, and winter wheat show that the plump seed gave a yield of 20.2 per cent more than the shrunken seed.

Six-year tests with sound and broken seed of barley, winter wheat, and peas gave the following results: Barley, sound seed 53.8 bu., broken seed 46 bu.; winter wheat, sound seed 46.9 bu., broken seed 9.3 bu.; and peas, sound seed 29.2 bu., broken seed 10.2 bu.

Emmer and spelt were sown as early as the land could be cultivated in the spring and at intervals of 1 week afterwards until 8 different seedings had been made. In every instance emmer gave better results than spelt. Emmer produced the largest crop from its second seeding and spelt from its first. There was but little difference in the yields from the first 7 seedings of emmer, showing that this crop may be sown late in the season, while spelt must be sown as early as possible in the spring in order to get the best results.

In growing a mixture of grains for feeding purposes the largest yield of grain, 2,612 lbs. per acre, was obtained from a mixture containing 1 bu. of oats and 1½ bu. of barley. For an early ripening crop it was found that Daubeney oats and Mandscheuri barley made an excellent combination, while with Siberian or Banner oats, the later 2-rowed barleys, as Chevalier or Canadian, are to be preferred.

An experiment to ascertain the relative value of different kinds of grain when in a mixture, in comparison with the same grains when grown separately, showed that barley and oats produced the largest percentage of grains in the resulting crop, while emmer produced but a small percentage, showing that while it is a heavy yielder when grown alone it is not so well suited for growing in combination with other crops.

During the past 18 years 287 varieties of oats have been tested at the college, and among the 53 varieties which have been grown for the last 5 years 15 have given average yields of more than 100 bu. per acre, Banner standing first with 109 bu. Among the early varieties Daubeney is perhaps the most promising in yield and quality, while other good sorts are Prosperity, Alaska, and Early White Pearl.

Four standard varieties of 6-rowed varieties have now been tested for 17 years in succession, with the following results: Mandscheuri 70.6 bu., Oderbruck 64.2 bu., Common 6-rowed 61.9 bu., and Mensury 60.2 bu. per acre. California Brewing gave a somewhat larger yield than Mandscheuri in the average of the last 5 years, but its weight per measured bushel was only 46 lbs., as compared with 50 and 52.6 lbs. for most of the other varieties. The beardless varieties have given much lower yields of grain than the others and their grain is decidedly light in weight. Five of the best varieties of 2-rowed barley grown for 5 years gave the following yields: Iowa No. 5590, 72.3 bu.; Iowa No. 5591, 71.2 bu.; Jarman Selected, 71.2 bu.; and Selected Canadian Thorpe, 68.5 bu. per acre. Among the varieties of hulless barley tested for 5 years, Guy Mayle stood first with a yield of 53.2 bu. per acre, followed by Hungarian with 50.3 bu., and Black Hulless with 49.1 bu. The yields of hulless barley are reckoned at the rate of 60 lbs. per bushel. In 9 out of the past 14 years fair yields of winter barley have been secured at the station, but in the other 5 years the crop was almost completely winterkilled.

Among 61 varieties of winter wheat grown in 1906, Abundance stood first in yield with 50.4 bu., and Prize Taker second with 50.2 bu. These 2 varieties are both white wheats, very closely resembling the Dawson Golden Chaff. Russian

Amber and Imperial Amber, 2 comparatively hard red wheats, came up to third and fourth places in yield of grain with 49.8 and 49.4 bu. per acre, respectively. All 4 varieties were over the standard in weight. The varieties giving the highest weight per measured bushel in 1906 were Northwester, Geneva, McPherson, Economy, and Auburn, but most of these excepting Auburn were rather low in yield. In general the white wheats yield more grain, possess stronger straw, weigh a little less per measured bushel, and are slightly softer in the grain than the red varieties. Of 20 varieties of spring wheat grown in succession for 5 years, Red Fife ranked first with a yield of 33.5 bu. per acre, Pringle Champion second with 33.1 bu., and Saxonka third with 33 bu. In average yields for 14 years of macaroni wheats it was found that Wild Goose stood first with 39.7 bu., Medeah second with 35.4 bu., and Bart Tremenia third with 34.8 bu. per acre.

The leading varieties and their yields of rye, buckwheat, field beans, soy beans, cowpeas, flax, swedes, mangels, sugar beets, carrots, corn, millet, rape, kale, cabbage, etc., are also noted.

Cereal crop experiments, J. H. SHEPPERD and O. O. CHURCHILL (*North Dakota Sta. Bul. 75, pp. 283–336*).—The varietal study of grains in continuous progress since 1892 at this station, together with the plats on which the work was carried on, is described, and the results for the year 1906 are reported in tables and discussed.

Forty-five varieties of wheat were grown in 1906. With the exception of 1 variety there was only 3 days' difference between the maturity of the earliest and latest sorts. No. 1718, a new selection from the breeding nursery, was grown for the first time, and the fact that it lodged less than the rest, the straw being stiffer, is taken as showing the results of careful selection in the nursery. The varieties of different classes of wheat giving the highest average yields for 4 years were as follows: Blue stem, Select Blue Stem, 28.9 bu.; fife, Select Powers, 26.8 bu.; and durum, Black Don, 31.7 bu. per acre. Fourteen out of the 15 varieties of fife and blue stem giving the highest yields in 1906 came from the plant nursery of the station, and when the averages for 3 years are considered, 9 out of the 10 varieties giving the highest yields came from this nursery. The average for 7 years gives the durum wheats an advantage of 4.47 bu. per acre, as compared with the fife and blue stem varieties.

The following varieties of durum wheat have given the best results in the station trials and are recommended for North Dakota: Gharnovka U. S. No. 5646, Yellow Gharnovka U. S. No. 5642, Aronautka, Black Don U. S. No. 5645, Kubanka U. S. No. 5639, and Velvet Don U. S. No. 5644. The average yields of these varieties varied from 29.4 to 31.1 bu. per acre.

Fertilizer tests with wheat were made on land cropped for 20 years without fertilizing. The years 1903 to 1905, inclusive, showed a maximum increase in yield of 2.3 bu. of wheat per acre as apparently due to the applications. The most effective commercial fertilizer application gave only ½ bu. greater yield of wheat per acre than the use of well-rotted stable manure.

Different methods of soil preparation showed that spring disked corn ground gave as an average for 3 years 1.4 bu. more per acre than fall plowing. Fall plowed land gave 2.6 bu. more than spring plowing.

Wheat was drilled at the rate of 5 pk. per acre and 2 lbs. of rape was sown in addition. The rape did not interfere with harvesting, but sometimes delayed the curing of the bundles. The rape plants were strong and healthy, and when the wheat was cut and conditions were favorable a large quantity of good fall pasturage was produced.

The average comparative yields of different grains for 8 years were as follows: Oats 1,969 lbs., emmer 1,945 lbs., barley 1,877 lbs., durum wheat 1,835 lbs., and wheat 1,711 lbs. of grain per acre. Of 28 varieties of oats grown in

1906, Big Four ranked first in yield, with 58.1 bu. per acre. The heaviest oats was produced by English, which weighed 38 lbs. per bushel. In considering the average yields for 4 years it is shown that the late-maturing varieties were the most prolific.

The percentage of hull and the chemical composition of the whole oat, the hull, and the meat were determined, and the results secured apparently indicate that seasons favorable for a variety of oats decrease the percentage of hull, that some varieties give uniformly a higher percentage of meat, and that correlation seems to exist between the weight per bushel and the percentage of meat to hulls. As the rudimentary kernels decrease in size the percentage of hull up to a certain degree increases. It was also found that the variety weighing most per bushel is not necessarily the most valuable, and that the thickness of the hull seems to be somewhat hereditary.

In 1906 the yield of barley, owing to excess of rain, was very low. Among the varieties grown for 4 years Russian stands first, with an average yield of 41.7 bu. per acre, followed by common and Mansury, with 37.9 and 37.8 bu., respectively. Great Beardless gave the lowest average yield and McEwan Hulless the next lowest. The 6-rowed varieties led in yield in nearly every case. The 2-rowed varieties have weaker straw and are more easily affected by adverse conditions than the 6-rowed sorts.

The highest average yield of flax for 3 years, 14.4 bu. per acre, was secured from Select Russian. A mixture of durum wheat and oats produced 1,950 lbs. of grain per acre, while the grain grown separately produced only 42 lbs. more. The mixed crop produced the larger proportion of wheat. The crops grown separately produced 3.8 lbs. more digestible protein and 7.7 per cent more digestible ether-extract than the mixture, while the mixture contained 20.1 lbs. more digestible carbohydrates than the separate crops.

Dry farming in New Mexico, J. J. Vernon (*New Mexico Sta. Bul. 61, pp. 54, pls. 30*).—This bulletin defines dry farming, describes in detail the different practices it includes, gives reasons why fall seeding is preferable to spring seeding, discusses the importance and methods of storing and conserving the moisture, gives directions for the use of seed under dry farming conditions, and points out the results that may be expected.

The methods followed, as well as the results secured, in growing oats, sorghum, melons, squash, corn, wheat, alfalfa, spelt, potatoes, millet, barley, and beans by dry farming at Isador and in the vicinity of Las Vegas are presented.

Report of chemist [Field crops], A. L. Knisely (*Oregon Sta. Rpt. 1905, pp. 53–57*).—Experiments in steaming silage during the process of filling the silo seemed to indicate that corn fodder is the crop best adapted to steaming. Determinations of acidity showed that untreated silage varied in acidity from 1.01 to 1.94 per cent and averaged 1.58 per cent, while in the case of steamed silage the variation was from 0.30 to 0.88, with an average of 0.53 per cent.

Experiments to determine the effect of summer fallow were carried on in pot culture tests. The data reported show that in the fall of 1901, during the first month in which leaching occurred, the summer-fallow pots lost from 3 to 5 times as much nitrogen as those not summer-fallowed, and during succeeding years the summer-fallowed pots invariably lost considerably more nitrogen than those upon which crops were grown.

[Report of the] department of chemistry, F. W. Morse (*New Hampshire Sta. Bul. 129, pp. 239–242*).—Several analyses of silage crops and of oat samples representing the different weights per bushel of market oats are reported with brief comments.

The results with oats show that the light oats are inferior to the heavy grades in protein, fat, and nitrogen-free extract, while the fiber is higher. It is stated that this difference is due to the fact that the light oats contain about 10 per cent more hulls than the heavy oats. There was but little difference in the composition of the various heavy grades, and throughout the series of analyses the average fiber increased as the average weight of oats decreased.

Cost of filling silos, L. CARRIER (*U. S. Dept. Agr., Farmers' Bul. 292, pp. 15, figs. 3*).—Data were gathered on 31 farms, in Jefferson and Fond du Lac counties, Wisconsin, and Branch and Lewanee counties, Michigan, with reference to the number and arrangement of men and teams, machinery used, and the length of time taken in putting up silage. Measurements of the silos and other necessary information were also secured.

In estimating the cost of filling a silo a rate of 15 cts. an hour was made for men and the same for a team of 2 horses. Engine hire was rated at $4.50 per day, including the engineer, twine at 11½ cts. a pound, coal at $5 a ton, and gasoline at 13 cts. a gallon. Wear and tear on machinery and boarding the help was not taken into account. Ten hours were considered a day's work. The cost per ton of silage, as determined by this investigation, varied from 46 to 86 cts. on the different farms. The average yield per acre was 9.1 tons, and the average cost per ton of silage 64 cts. The average amount of silage cut daily per man was 4.9 tons, and the average cost per acre for putting the corn in the silo $5.98. The different factors which cause the cost per ton of silage to vary are pointed out and discussed.

Pressing hay, F. W. TAYLOR (*New Hampshire Sta. Bul. 129, pp. 252, 253*).—Data regarding the actual cost of pressing hay are reported. In April 48 tons were pressed at a cost of $1.40 per ton, in January 51 tons at a cost of $1.21, and in October 46 tons at a cost of $1.59.

Alfalfa or lucerne, C. L. NEWMAN (*South Carolina Sta. Bul. 127, pp. 16*).—This bulletin presents popular directions for the culture of alfalfa in South Carolina.

The subjects treated are the selection of soil, soil preparation and manuring, sowing the seed, inoculation with artificial cultures, water-extract from inoculated soil, inoculated soil, the treatment of the alfalfa field during the first and second year, the cutting and curing of alfalfa hay, and the uses and value of the crop.

Beans, L. C. CORBETT (*U. S. Dept. Agr., Farmers' Bul. 289, pp. 28, figs. 12*).—The different types of beans, including broad, kidney, Lima, dolichos, soy, scarlet runner, and velvet beans, together with cowpeas, are described and detailed information as to the culture of field and garden beans is given. The portion of the bulletin devoted to garden beans includes a discussion of the culture of pole and bush Lima beans. The diseases and insect enemies of the bean crop are briefly considered.

Bean culture, G. C. SEVEY (*New York: Orange Judd Co., 1907, pp. 130, figs. 33*).—This book devotes a chapter each to the following subjects with reference to bean culture: History and botany, conditions affecting growth, soil and fertilizers, beans as nitrogen gatherers, varieties and where they succeed, seed selection, breeding, and seed growing, insects and diseases with remedies, cultural methods, harvesting the crop, composition and feeding value, markets and marketing, and garden beans.

A study of Delaware seed corn, H. HAYWARD and H. S. JACKSON (*Delaware Sta. Bul. 77, pp. 16, pls. 10*).—Statistics of the Delaware corn crop are given, the importance of corn breeding, the method of carrying on the work, and the selection and storage of seed corn are discussed, and the results of germination tests of 150 samples of Delaware seed corn are reported.

Descriptions are given of a champion $150 prize ear of corn produced in Iowa and of the best ear in the 150 samples of seed corn collected in Delaware. While the 2 ears were similar in most respects, the Iowa ear had 4 more rows of kernels and nearly 30 per cent more kernels. It is stated that the measurements of the kernels of the 2 ears indicated that those of the Iowa ear were heavier than those of the Delaware ear, and that consequently it would shell more corn to the cob. The Iowa ear also had a greater circumference and the kernels were deeper than on the Delaware ear.

Germination tests were made of 10 ears from each of the 150 samples. Ten kernels from each ear were germinated in a specially constructed germinator and 5 kernels from each ear were germinated in sand. In the germinator 20 per cent of the ears showed imperfect germination and in sand 20.1 per cent. The percentage of ears unfit for seed as determined by these germination tests in both sand and cloth was 28.

From the study of the samples collected it is concluded that much of Delaware corn is susceptible to and worthy of improvement, and that by systematic selection the yields might be increased from 20 to 40 per cent.

The shrinkage of ear corn in cribs, A. N. HUME and O. D. CENTER (*Illinois Sta. Bul. 113, pp. 361-376*).—This bulletin shows that as an average for 10 years past the Chicago cash price for corn has been 3.8 cts. per bushel higher in May than in December, or 6.3 cts. if 5 lbs. less ear corn is taken for a bushel at this time than in December. In order to find out whether it would be more profitable to market corn as early as possible after husking or to hold it, shrinkage experiments were conducted and the increases in price necessary to compensate for the loss in weight were determined. Corn cribs were constructed at Urbana and Sibley in such a manner that they could be lowered to rest upon the platforms of large wagon scales and weighed. At Sibley a check experiment was made by weighing each wagon-load of corn as it was put into the crib and weighing out all the corn when the crib was emptied at the end of the trial.

The data given in tables showed that the first year the shrinkages of the 2 cribs at Urbana and Sibley varied between 12.3 and 19.8 per cent. December 6, 1901, 20,545 lbs. of corn were weighed into a crib at Sibley and weighed out again September 25, 1903, when the weight was found to be 18,690 lbs. The loss in this case was 1,855 lbs., or 9 per cent for the entire period of 22 months. In a second crib treated identically as the first the loss amounted to 9.2 per cent. In a stationary crib filled with corn early in November and emptied about a year later the weights in and out were respectively 19,850 lbs. and 17,280 lbs., representing a loss of 12.9 per cent for the year.

It was found that the amount of shrinkage of corn in cribs varies widely, and that the increase in price necessary to compensate for this shrinkage must consequently also be subject to the same variation. The present rate of decrease in the weight of corn up to September of each year runs from 12 to nearly 20 per cent in the 4 different trials, and an increase in price for September varying between 4.9 and 8.6 cts. per bushel is necessary to compensate for this loss in weight. The shrinkage for the third quarter of the year was noticeably greater than that of the second, the average difference being 8.7 per cent. The shrinkage from June to September averaged only 2.1 per cent, and by far the most noticeable shrinkage occurred during the months of April and May.

From observations on the shrinkage of corn during the second year of storage in cribs it was apparent that practically all moisture comes out of ear corn during the first year. In the one trial at Sibley the shrinkage was 19.6 per cent at the beginning of the second year and had increased to only about 20.5 per cent by the following September. It is concluded from these results that it is apparently safe to assume that old corn may be stored in cribs with very slight loss from shrinkage.

The weekly weights of the corn under test are tabulated to show to what extent the crib weights were influenced by the amount of moisture in the atmosphere, the weather conditions at or near the time of weighing being noted. The results secured at other experiment stations in this same line of work are briefly reviewed.

Cotton, A. LALIÈRE (*Le Coton. Paris: A. Challamel, 1906, pp. 250, pls. 24, figs. 15, dgms. 2, map 1*).—This book is divided into sections treating of the importance of raw cotton in the cotton industry, the culture of cotton, its preparation for commerce such as ginning and baling, the characters of the plant, the uses made of the fiber, seed, and other products, the principal cotton-growing countries, and the recent extension of cotton culture in various European dependencies. A list of works consulted by the author in the preparation of the book is given.

Experiments in the late planting of cotton to avoid boll weevil damage during 1906, C. W. FLYNN (*Louisiana Stas. Bul. 92, pp. 8*).—Experiments were conducted to determine whether general late planting in regions infested by the boll weevil could reduce the damage done by that insect.

One experiment was conducted in Vernon Parish, a field of 2½ acres surrounded by forest and about 2.5 miles from any other cotton field, being planted on June 6. On June 14, when the cotton was up to a stand, no boll weevils were observed, but on July 21, when the field had just commenced to square, 10.4 per cent of the squares were found infested, and on August 15, 63.6 per cent. An inspection of some of the nearest fields on July 21 showed that from 20.4 to 78 per cent of the squares were infested with the boll weevil, and a later inspection showed 92.5 to 99.2 per cent of the bolls infested. The experiment field, which in previous seasons produced about 1,200 lbs. of seed cotton per acre without fertilizer and in spite of the weevil, this year with late planting produced only 266 lbs., although well fertilized and well cultivated.

A second experiment at Merryville gave similar results, and the conclusion is drawn that late planting will not serve to solve the boll weevil problem.

Preliminary report on distance experiments with potatoes, M. STEFANSSON (*Norges Landbr. Hoiskoles Akervekst. Aarsber., 1905-6, pp. 55-60*).—Experiments were conducted with 83 varieties of potatoes on 209 plats. The distance between rows was 60 cm. and that between the plants in the rows 20, 30, and 40 cm. The largest yields were in most cases secured by planting 20 cm. apart. The greater distances are considered advantageous only when heavy yields may be expected.—F. W. WOLL.

The nonsaccharine sorghums, C. W. WARBURTON (*U. S. Dept. Agr., Farmers' Bul. 288, pp. 28, figs. 9*).—A classification of the sorghums is given, together with historical notes on their introduction and culture in this country. The characteristics of the different varieties are pointed out and complete directions are given for the growing of these crops as well as their utilization for fodder, hay, pasture, silage, and soiling.

The 3 distinct classes of sorghums are the broom corns, the saccharine, and the nonsaccharine sorghums. The last named may be divided into 2 groups, Kafir corn and the duras. Kafir corn is stocky, leafy, with erect heads, while the duras usually grow taller, are less leafy, and often have the heads goosenecked. The nonsaccharine sorghums are of great value in semiarid sections. They grow on any good soil, but do best on a sandy loam and are remarkably resistant to drouth and alkali, although this resistance is not uniform for the different varieties. The poor physical condition in which they leave the soil may be overcome by proper tillage. Yields per acre of 25 to 50 bu. of grain and 2 to 5 tons of dry fodder is the usual crop. The grain and fodder are about equal in feeding value to corn, but are slightly less digestible.

It is further stated that the earliness, quality, and yield of the crop may be greatly influenced by careful selection of the seed.

Progress of the beet-sugar industry in the United States in 1906, C. F. SAYLOR (*U. S. Dept. Agr. Rpt. 84, pp. 135.*)—A general review of the beet-sugar industry for the year is given, and discussions on some important features and benefits of sugar-beet culture, the promotion of the sugar industry, new features relating to factory operations, and improved implements and devices for the benefit of beet growers are presented, together with the climatic conditions and farm and factory results by States for 1906, and statistics of the sugar industry in the United States and the world at large. The work with sugar beets of the Bureau of Plant Industry of this Department, comprising studies of the effects of fertilizers, of culture methods, methods of siloing, sugar-beet diseases, single-germ beet seed, breeding of strains for early maturity and for dry and alkali lands, methods of improving yield and quality, production and improvement of commercial beet seed, and the extension of the sugar beet area, is also briefly described.

The total number of factories operating in 1906 was 63. A total of 376,074 acres of beets, averaging a yield of 11.26 tons per acre, was harvested. The total quantity of beets worked was 4,236,112 tons, producing 483,612 tons of sugar. The average sugar in the beets was 14.9 per cent, the average purity 82.2 per cent, the average length of the campaign 105 days, and the estimated average extraction of sugar 11.42 per cent. The increase in acreage harvested over 1905 was more than 22 per cent, and the increase in the average yield of beets per acre as compared with that year was 23¼ per cent. The highest average yield per acre by States was produced in Utah, being 15.88 tons, and the next highest in Colorado, 13.41 tons.

The process of drying beets or cossettes prior to extracting their juices by diffusion, denatured alcohol in its relation to the sugar industry, and the development of conditions and prospects of extending the beet-growing industry are discussed. With reference to the drying of beets, it is stated that the practicability of the process has not as yet been established, but that enough of importance has been ascertained by experimentation to make it worthy of further tests. If practicable the process promises a reduction in the cost of beet sugar.

Under the direction of the Bureau of Plant Industry, 278 acres of American-grown seed yielded 14.32 tons per acre, with an average sugar content of 14.9 per cent or 4,267 lbs. of sugar per acre, while imported seed gave an average yield of 12.14 tons per acre, with a sugar content of 15.1 per cent, or 3,666 lbs. of sugar per acre. Twenty acres of seed beets, all of which analyzed 22 per cent or more of sugar, were grown at Fairfield, Wash., during the year. About 15,000 lbs. of seed were secured from these beets.

Sugar beet industry, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 69–71*).—The results of variety tests with sugar beets indicated that Rubensamen and Improved Imperial are equal in purity to Kleinwanzleben and contain slightly more sugar. Distance experiments conducted for 5 years showed a regular difference in the weight of the beets as the distance between the rows increased from 12 to 28 in. There was, however, no corresponding decrease in the percentage of solids and sugar or in the purity. It is believed that the best general results are obtained in rows placed as closely as possible without seriously inconveniencing the work of cultivation.

The chemistry of the sugar cane and its products in Louisiana, C. A. BROWNE, Jr., and R. E. BLOUIN (*Louisiana Stas. Bul. 91, pp. 103*).—This bulletin presents a summary of data collected during the past few years by the Louisiana Sugar Experiment Station.

The composition of the leaves, stalks, roots, and seeds of sugar cane and of the ash of the plant is shown in tables. The composition of the ash was found to vary widely with the variety of cane, type of soil, and manner of fertilization. It is stated that sugar cane contains only a very small quantity of fat or oil, mostly in the interior tissues, while the wax is found entirely upon the outer surface and constitutes about 1 per cent of the rind. The average total nitrogen of many analyses of sugar cane at the station was only about 0.05 per cent. An analysis of several stalks of Louisiana Purple cane showed that the nitrogen, although only a small quantity, is distributed among a large number of different bodies. Attention is also called to Beeson's work, which shows a greater localization of albuminoids in the nodes and of amids in the internodes. The rind, the pith, and the fibrovascular bundles, among which the fiber of the plant is distributed, showed a certain regularity with reference to all constituents except ash, the fibrovascular bundles standing intermediary between the rind and the pith. The rind showed the maximum and the pith the minimum of lignification The statement is made that the cellulose obtained from the cane resembles that of cornstalks. Notes are given on the 3 principal sugars, sucrose, dextrose, and levulose, and on the pectins or gums, and the acids.

In the study of the physiology of the growth and ripening of the sugar cane, analyses of the juice taken from the young cane at night and in the morning indicated a large decrease in the amount of sucrose during the night and a corresponding increase in the amount of reducing sugars. In the top joints, where growth is most intense, the disparity between sucrose and reducing sugars was greatest. In the middle joints, where the process of growth is being suspended, the reducing sugars are being reconverted to sucrose, which is then stored up in the pith cells as reserve juice. The same takes place in the bottom joints, only to a greater degree. Similar phenomena were observed in an analytical study of D 74 and D 95 canes at various intervals between the middle of July and the middle of October. A regular increase in the percentage of fiber and sucrose took place, although no fixed ratio between these 2 substances could be established. The ash, acids, nitrogenous bodies, and gums all showed a decrease as the cane matured. The reducing sugars, dextrose and levulose in the green tops and joints of the cane, and also in the stalks of very young canes, are present in very nearly equal amounts, but in the riper joints this relation no longer exists. The disparity in the content of dextrose and levulose increases with maturity until finally the levulose may nearly disappear.

In discussing the physiological rôle of the enzyms of the sugar cane, attention is called to the gradual falling off in sucrose content of sugar cane windrowed for any length of time, and it is shown by analyses made in 1893 that, if the green tops of the cane are removed at the time of cutting, the loss of sucrose is much less evident. In the windrowed cane from which the tops were not removed the loss of sucrose due to spontaneous inversion was very evident, and this is attributed very largely to the diffusion of the inverting enzym from the green tops into the stalk. The inversion of sucrose causes an increase in the glucose content. These results are taken as showing conclusively that the vital processes go on even after the cane is cut. The darkening in color of the juice immediately after extraction and also within the body of the cane is described as due to an enzym belonging to the class of oxydases. Other phenomena in which the action of enzyms plays a part are also discussed.

The results for 1903 show but little variation in the sucrose and glucose content and the purity of the cane up to the middle of September. After this date the canes of 1903 increased considerably faster in sucrose and at the end of the season showed an excess of 3.86 per cent over the sucrose content in the case of 1904. The climatic conditions for 1903 retarded the growth but hastened maturity, while those of 1904 promoted growth and retarded ripening. The variety also exerts an influence upon the composition. It was found, for instance, that the ash content in the juice of D 74 was 0.48 per cent, while D 95 stood second, with 0.41 per cent, Purple third with 0.40 per cent, and Striped fourth with 0.34 per cent, and this was also their relative position in sucrose content, while as regards reducing sugars the order was the reverse. It is stated that these results indicate that D 74 is the most vigorous feeder and has the greatest powers of assimilation and conversion. The conditions of cultivation also influence composition.

A comparison of many analyses of leading varieties at Audubon Park shows that stubble cane contains from 10 to 20 per cent less ash and over 50 per cent less nitrogen than plant canes, and that the deficiency of nitrogenous ingredients in stubble canes falls most largely upon the reserve supply of nitrogen or the amids, this being due to the greater nitrogen hunger of the stubble canes.

That soil and fertilization have their effect upon composition is shown by the fact that canes from the lower coast of the State sometimes contain 4 times the amount of chlorids found in canes raised above New Orleans.

Numerous analyses are reported in connection with the study of the composition of sugar-cane juice and the methods of extraction. According to the averages of 10 stalks of plant cane cut and topped according to the methods usually followed in Louisiana, the solids not sugar in the juice increase towards the upper portion of the stalk, taking a sudden jump in the last 2 or 3 joints. In some cases the purity of the juice in the upper joints is less than one-half that from the butt of the cane. Analyses of juices obtained by the mill and by the diffusion battery show that the percentage of mechanical impurities, such as gums, etc., is much higher in the mill juices. The hot water used in diffusion, on the one hand, coagulated a larger amount of albuminoid matter which was held back in the diffusion chips, but on the other effected the solution of a larger amount of amids and mineral matter.

The results of experiments upon alkaline and acid clarifications led to the suggestion that for Louisiana conditions, where the juices usually contain a high percentage of reducing sugar as compared with tropical countries, a carefully conducted sulphitation gives the most satisfactory results from the point of economy, as well as from the favorable output of sugar.

A schematic tabulation of yields and compositions of sugar-house products is given, and the effects of fermentation upon the composition of sugar-cane products is discussed.

Tobacco, W. H. SCHERFFIUS (*Kentucky Sta. Bul. 129, pp. 15, pls. 15*).—This bulletin discusses the selection of seed plants and care of seed, improved methods of handling tobacco, and the eliminating of undesirable varieties.

A hybrid obtained at the station by crossing Standup Burley with Sumatra was not very promising the first year, but showed a decided improvement in the second crop. This cross was made to develop a cigar wrapper by introducing into the Standup Burley some Sumatra blood.

Experiments are in progress at the station in a specially constructed drying shed to ascertain at what temperature and humidity Burley tobacco may be cured free from house-burn. In a compartment in which the tobacco was badly affected with house-burn the application of 10° of dry heat for an hour or more completely stopped the trouble. In the chambers where heat was continually applied no house-burn developed. Where sufficient heat was applied to increase the temperature from 100° to 120° F. tobacco cured with a greenish east, but this tendency was overcome to some extent by applying moisture at the same time.

In the work of eliminating undesirable varieties it was found that with 11 sorts of White Burley grown under uniform conditions the estimated yields varied from 1,479 lbs. to 2,137 lbs. per acre, or a difference of 658 lbs. per acre between the minimum and maximum yields.

The regulations for the culture of tobacco in France, A. MURAT (*La Réglementation de la Culture du Tabac en France. Toulouse: Univ. Toulouse, 1906, pp. 151*).—This thesis traces the history of tobacco culture in France from its beginning to the present day, and brings together the different laws and regulations with reference to its culture which have been enforced from time to time A bibliography of the official documents and of general and special works on this subject, which have been consulted in the preparation of the thesis, is included.

Modern plant-breeding methods, with especial reference to the improvement of wheat and barley, R. H. BIFFEN (*Sci. Prog. Twentieth Cent., 1 (1907), No. 4, pp. 702-722*).—This paper contains an historical review of plant breeding, discusses the hybridization of wheats and barleys with reference to Mendel's law, and considers the subject of breeding disease-resistant plants.

HORTICULTURE.

[**Horticultural investigations in Alaska**], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1906, pp. 10-14, 23-38, 46, 47, 50, 51, 53-66, pls. 3*). Notes are given of the results secured at the Alaska experiment stations located at Sitka, Copper Center, Rampart, and Kenai in variety and cultural tests of various vegetables, orchard and small fruits, and flowers Large quantities of seed, fruit trees, and bushes have been distributed to various parts of the territory, and the reports are here given from several of the cooperators with regard to the trial and behavior of these seeds and plants.

It is believed that the native crab apple (*Pyrus rivularis*) may have a possible value as a stock for dwarf trees. Dwarf trees are considered to be superior to standard trees in this region since they bear earlier, can be more easily protected when necessary, admit of closer planting, and are less exposed to the wind. A number of varieties of apples have been grafted on this species by various methods. The crown grafting appears thus far to be the most successful, while top-worked trees do fairly well.

An attempt is being made to develop varieties of strawberries and raspberries adapted to the climate by cross-fertilizing cultivated varieties with wild native species. Several species of currants are also found native in Alaska and are being brought under cultivation. Attempts to cultivate the eastern cranberry have proved unsuccessful and the experiment has been dropped. The so-called Alaska cranberry (*Vaccinium vitisidæa*) is said to produce a small but very delicious fruit, no larger than the red currant. It grows on old stumps and decayed logs and on little knolls just out of the standing water. Plantings of this berry have been made at the station.

[**Report of**] **the professor of horticulture,** H. L. HUTT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 138-149, figs. 5*).—An outline is given of work conducted for the year with orchard and small fruits, vegetables, and flowers, including data on results secured from a trial of a large number of plants as orchard cover crops, fruit variety tests, and notes on plant breeding experiments.

In the investigations with tree fruits, commenced about 10 years ago, apples appear to have stood the adverse conditions better than most of the other fruits, all of which suffered more or less in the severe winter of 1903–4. Notes are given on the varieties of apples, pears, plums, and cherries being grown in the orchard. Pears are considered more or less a failure, and only the hardiest varieties of cherries of the sour type have withstood the climate.

An extensive variety test was conducted with raspberries, blackberries, currants, gooseberries, and strawberries. With red raspberries Marlboro is considered the best early variety in the trials thus far, and Cuthbert the best late variety. Herbert, a new variety originated with R. B. Whyte, is said to rank first among the red varieties this year; Columbian is considered the best purple variety; Older and Smith Giant the best blacks, and Golden Queen the best yellow variety. In regard to blackberries, the conclusion is reached, after 10 or 12 years' testing of 23 varieties, that they can not be satisfactorily grown. Eldorado and Agawam have proved the hardiest. Of the currants, the White Grape has usually been the most productive of the 46 varieties grown. During the past season Climax, a new black variety, gave the largest yield. The other leading varieties of currants are similar to those previously noted (E. S. R., 17, p. 862). Forty-five varieties of gooseberries were tested, of which 36 have fruited. The most productive varieties have been those of American origin, such as Pearl and Downing. Lady Leicester, a new variety, has given the heaviest crop for the past 3 years. The fruit, however, is small and is not recommended for general planting. Of the large fruit varieties, Red Jacket and Whitesmith are considered the best, although not nearly so productive as Pearl or Downing. Among the strawberries, of which over 400 varieties have been carefully tested, the following are recommended to give a constant supply of berries from early to late season: Early varieties, Splendid, Warfield, and Haverland; midseason, Williams, Ruby, Clyde, and Parson Beauty; late, Buster. The last variety, although a heavy yielder and valued for home use or market, is considered undesirable for canning on account of its light color.

The plant-breeding work of previous years has been continued and a great number of crosses of various kinds have been made. A large number of berries were produced as the result of using pollen of Falstaff, a European raspberry, on Herbert and Cuthbert raspberries, from which it is hoped to obtain the quality and size of the European berry and the hardiness of the native species. Columbian was successfully crossed with the strawberry-raspberry. An attempt is being made to improve the common chokecherry by the selection of pits from large fruit found to be much less astringent than the average.

Practical treatise on horticulture for Northern Africa, L. GUILLOCHON (*Traité Pratique d'Horticulture pour le Nord de l'Afrique. Tunis: S. Père & Sons, 1907, pp. III + 490, figs. 30*).—This work is introduced with some general considerations on garden making, necessary equipment and tools, and various methods of propagation. Part 1 deals with the vegetable garden, the cultivated species being arranged in alphabetical order and classed as herbaceous, bulb, fruit, and seed crops. Part 2 treats of the cultivation of fruit trees, including the various phases from the orchard nursery to the storage of the fruit, and concludes with a list of species suitable for cultivation in Algeria and Tunis. Part 3 discusses ornamental arboriculture, with suggestions on the subject of reafforestation and various forms of planting. Part 4 is devoted to ornamental and commercial floriculture, all the varieties of flowers suited for Northern Africa being considered. Part 5 treats of the cultivation of the agave fiber plants. The book is concluded with a working schedule for each month of the year.

Ringing herbaceous plants, U. P. Hedrick, O. M. Taylor, and R. Wellington (*New York State Sta. Bul. 288, pp. 193–209, figs. 4*).—This bulletin reports experiments in ringing 2 herbaceous plants, the tomato and chrysanthemum, which were selected because their product and manner of growth should show to advantage the effects of ringing.

Some general considerations are given on the objects of ringing woody plants and the theory upon which ringing is founded, and the present experiments with herbaceous plants are described and discussed in detail.

The tomatoes were trained to a single stem and were ringed in the winter of 1905–6. The first group was ringed when the second cluster of fruits had set, and the second group when the fourth cluster had set. The plants in the third group were unringed. The ringing consisted of removing a ⅝-in. strip of bark, cutting through to the woody tissue. As the result of this experiment it was found that the height of the stems were not affected, but there was a tendency toward the thickening of the whole stem above the wound. Ringing had no effect upon the time of maturity, color, or flavor of the fruit. The average number of fruits per plant was reduced 18 per cent by the first ringing and 10 per cent by the second ringing, and the average loss in weight per plant attributed to the first ringing was 16 per cent, and to the second ringing 12 per cent. During the first ringing there appears to have been a gain of 0.06 oz. in the average fruit, although in the second ringing a loss of 0.05 oz. is noted. The foliage of the ringed plants was more or less abnormal, and the roots were less developed, fewer in number, and smaller in size.

Several varieties of chrysanthemums were treated in the same manner in the autumn of 1906. The first group was ringed just as the buds appeared, and the second when the buds were one-third grown, the interval between ringings being about 2 weeks. In this case ringing decreased the height of the plant. The first ringing appeared to hinder the opening of the buds in all the varieties except one, and the second ringing to slightly hasten the maturity of all except one. The size of the blossoms of all varieties was reduced, and the earlier the ringing the greater the injury. Ringed plants produced almost no suckers. The foliage and roots of the plants suffered in the same manner as with the tomatoes.

From the results secured, the authors conclude that it is very doubtful if ringing can be made beneficial to herbaceous plants, the loss to the plant being great, with little or no compensating gain.

Ringing detrimental to tomatoes and chrysanthemums, F. H. Hall (*New York State Sta. Bul. 288, popular ed., pp. 4*).—A popular edition of the above.

In order to have artichokes the greater part of the year, R. Beziat (*Jardin, 21 (1907), No. 482, pp. 90–92*).—This article contains directions for the culture of the globe artichoke in various regions of France, together with varieties recommended for each.

Some attempts in the grafting of Solanums, E. Griffon (*Bul. Soc. Bot. France, 53 (1906), No. 9, pp. 699–704, pl. 1*).—In order to make personal observations as to the influence, if any, of the stock on the graft and vice versa, the author made several grafts, including the potato on the tomato, the tomato on the potato, the tomato on the egg-plant, the egg-plant on the tomato, and *Solanum laciniatum* on *S. ovigerum*. Stocks of the parent plants were grown side by side with the grafted plants, under the same condition of soil and culture.

As a result of these experiments the author concludes that no variations took place either in method of growth, form, or shape which would indicate any influence of the stock on the graft, or reciprocally, but that the variations which were noted occurred just as frequently on ungrafted plants and may be attributed to the same causes.

Marketing fruit and truck crops, W. N. Hutt (*Maryland Sta. Bul. 116, pp. 211–257, figs. 39*).—This bulletin contains information with regard to the grading, packing, and marketing of a large variety of fruit and truck crops, and is introduced by a discussion in regard to the value of standard packages, brands, and trade-marks, and the relations of the railroads, commission men, and fruit dealers to the grower.

Accounts are also given of the New York fruit exchange and a few types of cooperative fruit-shipping associations or exchanges. The text is accompanied by several figures illustrating various styles of fruit packages, etc.

Orchard management, C. I. Lewis and W. H. Wicks (*Oregon Sta. Bul. 93, pp. 47, figs. 28*).—This bulletin contains popular directions for growing the more important kinds of orchard fruits, including a discussion of the location and site, soil, drainage, methods of cultivation, use of cover crops and fertilizers, irrigation, pruning, thinning, spraying, pollination, etc.

The State is divided into 5 horticultural districts, and lists are given of apples, pears, cherries, plums, prunes, peaches, grapes, strawberries, raspberries, blackberries, currants, and gooseberries adapted for planting in the several districts.

The apple from orchard to market, C. I. Lewis (*Oregon Sta. Bul. 94, pp. 48, figs. 34*).—This bulletin contains popular directions for harvesting, grading, packing, and marketing fruit, together with suggestions for the formation of cooperative associations. In an appendix by E. H. Shepard the various features of the Hood River apple growers' union are described, including the articles of incorporation and by-laws, together with advice and special directions to growers and packers. Extracts are also given from the Canadian fruit marks act of 1901. The text is well illustrated.

The home apple orchard, M. S. McElroy (*Farming, 3 (1907), No. 4, pp. 140, 141, figs. 7*).—Directions are given for the planting and subsequent care of a home apple orchard, together with a list of varieties recommended for planting in different sections of the United States.

The effect of wood ashes and acid phosphate on the yield and color of apples, U. P. Hedrick (*New York State Sta. Bul. 289, pp. 211–235, dgm. 1*).—This bulletin contains an account of an experiment conducted by S. A. Beach in the station orchard from 1893 to 1904, inclusive, regarding the value of potash, phosphoric acid, and lime as found in wood ashes and acid phosphate for fertilizing apple orchards.

The experiment was originally planned to determine the effect of wood ashes on the scab fungus in the apple, as well as the value of the ashes as a fertilizer. At the end of 5 years it was determined that the wood ashes had no material effect on the scab fungus, and this feature of the experiment was dropped. A preliminary report of the experiment as published in 1897 has been noted (E. S. R., 10, p. 452).

The present account is based on the above report, together with subsequent data. In 1898 the test of wood ashes was supplemented by one of acid phosphate, and the two experiments were conducted through 1904. The trees, of which there were 94 in the test, were 43 years old at the beginning of the experiment, and included the following varieties: Baldwin, Fall Pippin, Rhode Island Greening, Roxbury, and Northern Spy. The orchard was divided into 8 plats, 4 treated and 4 untreated. Wood ashes were applied at the rate of 100 lbs. per tree, or 4,800 lbs. per acre, to which was added during the last 7 years acid phosphate at the rate of 8½ lbs per tree, or 408 lbs. per acre. From these applications it is calculated that the trees were supplied each year with

169 lbs. per acre of actual potash, 72 lbs. of phosphoric acid from the ashes, as well as 57 lbs. from the acid phosphate, and lime at the rate of 32 lbs. per tree, or 1,536 lbs. per acre.

The effect of the fertilizer was measured by the yield and color of the fruit. Although there was a slight annual average increase in yield per tree on the treated plats for the several varieties, with the exception of Northern Spy, the results are considered practically negative from a financial standpoint, since the calculated gain per year on 5 acres is only $24.50, or not more than enough to pay for handling the fertilizers. It is also noted that both the treated and untreated plats increased markedly in yield from 1893 to 1904. By way of explanation it is stated that prior to 1893 the orchard was in sod, but during the experiment was kept under cultivation and grew more productive. The results as to the color of fruit appeared to lack uniformity and "were not decided enough in a sufficient number of the 12 seasons to enable us to state that the fertilizers applied improved the color of the apples." The influence on color appeared most marked in seasons with climatic conditions unfavorable to the development of the fruit.

With regard to the practical application of the results obtained in this experiment, it is believed that fruit growers should not apply manures in quantity until good evidence has been obtained as to what food elements, if any, are wanting in the soil. This should be ascertained by fertilizer tests conducted directly in the orchard in question. A brief plan adapted from a fertilizer experiment under way for the past 10 years in a young apple orchard on the station grounds is given to be used by the grower in determining to a certain extent what fertilizer his orchard needs.

Unprofitable orchard fertilizing, F. H. Hall (*New York State Sta. Bul. 289, popular ed., pp. 8, fig. 1*).—A popular edition of the above.

Evaporation of apples, H. P. Gould (*U. S. Dept. Agr., Farmers' Bul. 291, pp. 38, figs. 16*).—This bulletin contains an account of the author's studies with regard to the evaporation of apples, including a description of several types of evaporators adaptable for home and commercial purposes, various evaporator appliances and conveniences, methods of preparing and drying the fruit, and information in relation to the grading, marketing, and storing of the product. The subject-matter is well illustrated.

The cherry, F. Peneveyre (*Chron. Agr. Vaud, 20 (1907), Nos. 2, pp. 29–32; 3, pp. 53–57; 4, pp. 74–80; 7, pp. 146–153; 8, pp. 157–162, figs. 16*).—This is a short treatise on the cultivation of cherries, including a botanical description of the genus, methods of propagation, nursery practices, training, selection of site and soil, planting distances and operations, fertilizers, various styles of planting, and subsequent care.

Fertilizers on prune trees, A. L. Knisely (*Oregon Sta. Rpt. 1905, pp. 57–59*).—Fertilizer experiments were conducted on a 5-acre Italian prune orchard during the 4 years from 1901 to 1904, inclusive. The soil was classed as a loam and was similar to many other prune orchard soils. Alternate rows throughout the entire orchard were treated with nitrate of soda, Thomas slag, muriate of potash, and sulphate of potash, either alone or variously combined.

The results secured in the last 3 years of the experiment are presented in tabular form, showing the average yield of fresh prunes per tree. No marked effects from the different combinations of fertilizers were noticed during the growing season, and the results were not decided enough to indicate a very profitable use of fertilizers.

Further experiments are to be made in order to ascertain whether the quality of the fruit has been affected by the fertilizers, in which special attention will be given to the sugar and acidity in the ripe fruit.

Notes on the Tunis varieties of olives, R. MARCILLE (*Bul. Dir. Agr. et Com. [Tunis], 2 (1906), No. 41, pp. 511–527*).—In 1900 olive plantations were established at the colonial school of agriculture and at the experimental garden of Tunis. At the present time over 80 varieties have been brought together, many of which have fruited for the past 2 seasons.

In this article the observations which have been made on these plantations are presented, including a study of the relative value of the varieties of olives utilized for pickling, the value and the yield of those used in the extraction of oil, and the quality of the oil derived from Tunis olives.

The article concludes with a discussion of the methods of propagating the olive. The author is of the opinion that propagation by seed brings about the best results. It is stated that the seed-grown trees are much hardier, more resistant to disease, and more productive than plants propagated from cuttings. The principal disadvantages of seed-grown plants are the increased length of time before they come into bearing, and the necessity of grafting.

Work conducted at the government's American grape nurseries at Nicastro and Palmi for the three years 1904–1906 (*Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 2 (1907), No. 1, pp. 34–44*).—This is a summary, together with the more important data, relative to work conducted at the government nurseries of Nicastro and Palmi in the testing and distribution of American grapes for the 3 years 1904–1906.

During this period a total of 813,325 cuttings and grafted plants were distributed from the Nicastro nursery, and 890,360 from the nursery at Palmi Tables are given showing the species and varieities of stock plants grown, the kind of soil, and notes on vegetative conditions. The relative merits of the different species, as to their resistance, adaptation, and value as stocks for European grapes are also discussed

Tables are given showing the hybrids grown at both nurseries, the kind of soil, the number of plants of each variety, and observations as to vigor, fruitfulness, etc. The article also includes a discussion of the Roncet disease, and notes on the school of grafting and the demonstration farm.

Selection and preparation of vine cuttings, F. T. BIOLETTI (*California Sta. Circ. 26, pp. 7*). In this circular the author discusses the importance of a proper choice of cuttings as a factor in determining the profitableness of vineyards, and makes popular suggestions regarding the means of obtaining cuttings capable of growing into strong, heavy-bearing vines.

Among the phases considered are the choice of locality, vineyard, vine, and part of vine in selecting cuttings, together with the form and length of cutting, and methods of conservation.

Concerning the bagging of grapes, J. B. PILLOT (*Jardin, 21 (1907), No. 483, pp. 107, 108*).—This is an account of the author's experiments in the bagging of grapes conducted at Nancy, France.

The principal advantage noted is that many of the finer varieties of grapes which will not mature their fruit well in the open air in the cooler regions in the eastern part of France, will yield satisfactorily when the fruit is bagged. While he found a number of dried and scalded grapes among those included in his bagging experiments, this is attributed principally to the lack of ventilation.

In the author's spraying experiments, the ordinary method of spraying grapevines with a solution of copper sulphate appeared ineffective as far as the fruit was concerned, although it was found effective in preserving a healthy foliage. Experiments in the dusting of grapes with dry copper sulphate were carried on for a period of 2 years. It is stated that the fruit matured well and gave abundant yields, while with the check plats, which were sprayed in the ordinary manner, the grapes suffered severely from mildew.

Tea culture, with notes on the production of indigo in Java, W. Detmer (*Botanische und landwirtschaftliche Studien auf Java. Jena: G. Fischer, 1907, pp. 44–51*).—A brief account is given of the cultivation of tea in Java, including the planting, fertilizing, harvesting, and preparation for market, together with a description of the extraction and fermentation of indigo in Java, and a discussion as to the advisability of growing indigo as a cultivated crop in that country. Although the price of artificial indigo is much lower than that of the natural product, the author is of the opinion that this crop might be used as a combination crop with tea, since after the extraction of the indigo the large amount of plant material remaining can be used as a fertilizer for the tea.

Notes on palms and the exotic species cultivated in Egypt, A. d'Abaza (*Alexandria Hort. Soc. Bul. 2, 1907, pp. 1–46*).—A botanical description and classification of palms, together with a descriptive list of exotic species growing in Egypt and a list of those recommended for introduction into that country.

FORESTRY.

Improvement of the woodlot, H. D. House (*South Carolina Sta. Bul. 129, pp. 14, figs. 2*).—This bulletin is presented with a view to interesting the land owners and farmers of western South Carolina in the improvement of the depleted forest conditions of that region.

The present work deals largely with a discussion of surveys made of 2 tracts of woodland near Clemson College, including a description of the areas and tabulated data with reference to their composition and size of the timber, and the conditions found in these areas which will work favorably and unfavorably on the value of the tracts.

Suggestions are given for the care and improvement of the forest and woodlot, together with a list of valuable native trees for planting on different types of soil in western South Carolina. *Catalpa speciosa* is considered one of the most valuable for extensive planting in low grounds, as it has a rapid growth and possesses superior qualities for posts and ties.

Forest revenues and forest conservation, J. F. Clarke (*Canad. Forestry Jour., 3 (1907), No. 1, pp. 19–30*).—In this address, delivered at the forestry convention, Vancouver, September, 1906, the author discusses the disastrous effects of the present methods of lumbering on the conservation of Canadian forests, and points out the salient features and one notable omission of the present system of agreements between sellers and lumbermen, with special reference to their influence on the character of the logging which they authorize and should, but do not, control.

The author states, in substance, that the present form of agreement existing between sellers and lumbermen places a premium on the destruction of lumber, and that the solution of the problem of conservation will be reached when a system of sale of public timber is evolved and made effective by which the State and the lumbermen become partners, with mutual profit, in the work of renewing the forests by the act of logging the matured trees.

A table is given showing the annual ground-rent payment per square mile for the different provinces and on dominion lands, with sums computed at 6 per cent interest compounded annually, to which these annual payments amount for different periods of from 30 to 100 years. Particular attention is directed to the manner in which the tax bill runs up the longer the time between loggings. Where the lumberman is the forester the influence of a ground rent is said to be towards earlier utilization and clean cutting, with the abandonment of the land after the timber is removed.

With respect to cutting regulations it is stated that the dearth of any effective measures to control the cutting on Canadian limits is nothing short of a disaster alike to the future lumbering industry and to the future forest revenue.

In conclusion the author submits an outline of a method of disposing of crown timber which, it is believed, will offer a simple, practical, and business-like solution of the problem.

Annual of streams and forests for 1906 (*Ann. Eaux et Forêts, 45 (1906), pp. 370*).– This contains tables complete to January 1, 1906, with reference to the personnel of the forest administrations in France and Algeria, and lists of pro motions from the National School of Streams and Forests and from the secondary school of technical and professional education for foresters, together with numerous statistics of general interest.

Training and examination of private forest officials in Germany, M. LINCKE (*Ausbildung und Prüfung von Privatforstbeamten in Deutchland. Neudamm: J. Neumann, 1906, pp. VIII + 180*).—This is a manual of information for the private forest officials of Germany with respect to examinations, positions, appointments, transfers, etc., and is also intended as a guide for candidates for the profession of forestry.

[Report of] the lecturer in forestry, E. J. ZAVITZ (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 194–200, figs. 6*).—This is an outline of the forestry work conducted during the year in the college woodlots and nurseries, including notes on the species of trees grown. A brief account is also given of cooperative planting experiments undertaken during the past season. About 20 plantations in all were established during the year in several counties of the province, in which about 80,000 plants were used.

Report of the forestry branch, 1906, R. D. HAY (*Rpt. Forestry Branch N. S. Wales, 1906, pp. 9, figs. 8*).—This is a report as to the forest areas, administration, and sylvicultural work, together with a financial statement to June 30, 1906. The area included in forest reserves was 7,749,579 acres. During the year 184 sets of specimens, comprising 4,420 kinds of timber, were prepared by the Museum of Economic Forestry and issued in advertisement of the timbers of the state. The state forest nursery now contains a considerable variety and stock of plants in all stages of growth, amounting to about 100,000. Plants amounting to 49,885 were distributed during the year.

The revenue for the year was £42,738 1s. 7d., the expenditures £16,638 18s. 10d., leaving a surplus of £26,099 2s. 9d. During the year 339 sawmills were in operation, which employed 3,806 people. The number of persons directly employed in connection with the timber industry was 16,800. Satisfactory results are being obtained in the eradication of the prickly pear. A table is given showing by States the extent of forest resources of the Australian continent. Australia has an acreage of 1 wooded acre for approximately every 18, and 1 acre in every 109, or about 0.9 per cent of the total area of the continent, is reserved for forestry.

This report is accompanied by the report of the government botanist on forestry work, consisting of an outline of the work conducted during the year, and by several illustrations of large timber trees and lumber operations in New South Wales.

Western Australian timber tests, 1906, G. A. JULIUS (*Perth: Govt., 1906, pp. 36, pls. 72*).—This is a report of the results of over 16,000 tests upon the physical characteristics of the hardwoods of Western Australia, including tests in cross-bending, tension, end and cross compression, shearing, hardness, effect of repeated blows, moisture, the holding power of the various timbers upon railway dog spikes both with green and dry timbers, with spikes both newly driven and those remaining in sleepers for a varying number of years, chemical tests to determine the nature of the sap present in the various timbers and its effect upon metals, and investigations to determine the resistance of these timbers to dry rot, white ants, etc.

In the moisture tests each section was cut immediately after the completion of the physical test and the moisture condition determined. The position of the tree from which a specimen was cut was taken into consideration, and a complete record of the sections used for all tests was kept with reference to the direction of holding relative to the annual rings and radial lines.

The data obtained from the tests are summarized upon numerous accompanying schedules and diagrams. Examples are given illustrating the application of the diagrams and formulas used in testing, and the methods of testing and machinery used are described and illustrated. In addition to the detailed descriptions a general summary of the results has been brought together on a large schedule, which shows the strength of the Western Australian hardwoods as compared with recent available data concerning the most important of the world's hardwoods.

In all 10 species of eucalypts were tested, of which the more important are jarrah, karri, tuart, blackbutt, wandoo, York gum, red gum, and yate. Several other kinds of wood were also tested. The heaviest of the Western Australian timbers, and of all the Australian timbers of note, were found to be yate and wandoo, which averaged 79 lbs. per cubic foot when first cut and remained the heaviest when seasoned at 12 per cent moisture. The strength of the weakest of Western Australian eucalypts is said to be equal to that of hickory and about 20 per cent greater than that of the best oak. Yate (*Eucalyptus cornuta*), common in the southeastern portion of the state, but still practically unknown as a timber, is believed to be the strongest "sawn" timber in the world, since in all of the present tests it was far ahead of the rest of the Australian hardwoods. In one tensile test this timber withstood a breaking load of 17½ tons per square inch, or about 3¼ tons below that usually specified for wrought iron of ordinary quality.

Forest trees of New Jersey, B. D. Halsted (*New Jersey Stas. Bul. 202, pp. 52, figs. 25*).—This bulletin contains a list of trees either native to or growing wild in New Jersey, and is intended to serve as a guide in the further tree canvass of the State and ultimately to aid in the work of developing a genuine and systematic sylviculture therein.

The list is based upon N. L. Britton's "Flora of New Jersey," published by the Geological Survey in 1889. Information with regard to localities for the species and further notes are derived from various sources, enumerated herein. The botanical names of the species are given, together with some of the common names and the area of distribution. A list of various forestry papers is given near the end of the bulletin, together with a brief digest of the various legislative acts relating to forestry. The engravings are from Sargent's "Manual of the Trees of North America."

Studies of species of forest trees, H. Hesselman (*Skogsvårdsfor. Tidskr., 5 (1907), No. 1, pp. 1-18, pl. 1, figs. 4*).—This is the first of a series of articles on different species of forest trees. The present paper deals with the delayed formation of chlorophyll in *Picea excelsa*, var. *versicolor*, notes on a mountain spruce of unusual type, and a discussion of pine trees with large seed production.—F. W. WOLL.

Notes on balsam fir, B. Moore and R. L. Rogers (*Forestry Quart., 5 (1907), No. 1, pp. 41-50*).—The authors made investigations near Frenchtown, in the north central part of Maine, on spruce and fir forests for the purpose of ascertaining the best sylvicultural practices for maintaining the proportions of spruce wherever possible, as well as to get the best results from the fir. Observations were made as to the tolerance, power of recovery after suppression, resistance to windfall, soundness at different ages and under different conditions, and rapidity of growth of fir as compared with spruce.

Fir was found to be less tolerant than spruce, and especially subject to windfall in north central Maine after a diameter of 15 in., breast high, is reached. In a pure stand fir is subject to rot at the butt after the age of 50 years, particularly in moist situations. When mixed with hardwoods the percentage of rot is said to be smaller and the trees are usually sound up to an average age of 85 years.

After windfall in a pure spruce flat or slope, a pure stand of fir follows, whereas on lowland areas, under normal conditions, the fir occupies less than 5 per cent of the stand, with an increasing percentage on upward slopes. After windfall in a spruce stand containing hardwoods, a stand predominantly hardwoods and fir results. On mixed hardwoods and spruce slopes the proportion of fir is doubled after each cutting. When the cut is too heavy the fir will surpass the spruce in the next generation.

In conclusion the authors state that although the fir is seen to be more abundant in the young growth after cutting, it is probable that in many cases it will eventually die out and its place be taken by the spruce. While the fir is growing, however, it is not only retarding the spruce but occupying space, and thus causing just so many years' loss of growing time to the spruce.

Hevea brasiliensis in Singapore, R. SCHLECHTER (*Tropenpflanzer, 11 (1907), No. 3, pp. 133–141*).—An account of the Hevea plantations of the botanical gardens of Singapore, dealing with the constitution of the stands, production of seed, and methods of harvesting the Hevea, together with a discussion of pure stand planting versus companion crop planting. The author believes that the attempt to keep down harmful weeds in pure stands is too costly, and suggests the use of cover crops, recommending such species as *Passiflora foetida*, *Crotalaria stricta*, and one of the Tephrosias, which will not only keep down harmful weeds but add plant food to the soil as well.

Where companion crops are desired admixtures of cacao, coffee, tea, peanuts, tapioca, and upland rice are recommended for different situations.

Latex and rubber of Parameria glandulifera from India (*Bul. Imp. Inst., 5 (1907), No. 1, pp. 14–16*).—This brief article states that *Parameria glandulifera*, a climbing plant, is distributed through southern Burma, Indo-China, and the Malay Peninsula, and has long produced a yield of good rubber, which is exploited by the native collectors. Samples of the latex and rubber of this plant have been forwarded to the imperial institute from Burma and the Andaman Islands, and the dry rubber was found to contain 91.8 and 91.6 per cent, respectively, of caoutchouc. In each case the percentages of resin and proteids are low and the rubber is free from vegetable impurities.

DISEASES OF PLANTS.

Studies in the inheritance of disease resistance, R. H. BIFFEN (*Jour. Agr. Sci., 2 (1907), No. 2, pp. 109–128*).—While studying the inheritance of certain characteristics of wheat the author was led to believe that possible liability and immunity to attacks of yellow rust were paired characters, and experiments were inaugurated to determine on an extensive scale whether immunity to attacks of different fungi might be transmitted in the usual Mendelian way.

The experiments consisted in crossing a number of varieties of cereals and testing their resistance to yellow rust, black rust, and a mildew of cereals (*Ery-*

siphe graminis). A considerable collection of varieties of wheat and barley was obtained and various grades of resistance were established by crossing the resistant and susceptible varieties. The hybridizing was done in 1904 and the results reported were observed during their growth in 1904 and 1905.

The results showed that crossing immune and susceptible varieties yielded offsprings susceptible to disease. Upon self-fertilization of these susceptible individuals, immune and susceptible descendants in a proportion of 1 of the former to 3 of the latter were secured. Where the degree of susceptibility differed in the two parents, the hybrid resembled the more susceptible parent in that respect. The relatively immune forms breed true to this characteristic in the succeeding generations. In all experiments the degree of susceptibility was found to be variable. Immunity appears to be independent of any discernible morphological character, and it is entirely practicable to breed varieties morphologically similar to one another but immune or susceptible to parasitic fungi.

A contribution to the biology of phanerogamic parasites, A. FRAYSSE (*Rev. Gén. Bot., 19* (*1907*), *No. 218, pp. 49–69, figs. 13*).—The author presents a résumé of his more extended work,[a] giving the results of his observations and experiments with a considerable number of phanerogamic parasites. The general biology of the parasites is described, after which their physiology is discussed.

In the species studied, the author found that the parasites attack the roots of the host plants by means of haustoria, and they are apparently limited to those hosts which offer large reserves of carbon compounds, such as are found in plants possessing bacterial tubercles, mycorrhiza, starch cysts, etc. The number of haustoria seems to be limited by the host plant, but their form and duration are determined by the necessities of the parasite. The haustoria are believed to represent modified roots which are adapted to the purposes of absorption through their peculiar mechanism.

In some chlorophyll-bearing species the parasite takes from the host only a portion of its mineral and organic carbon, while in others practically all of the organic carbon is received from the host plant. As a result of his experiments the author claims that glucose is the principal source of carbon taken up by the parasites, and that while starch is abundant in the host it is transformed into sugar by the diastases.

The haustoria are said to force their way into the host plant through the action of certain diastases, the most common of which is cellulase.

Bacterial diseases of fruits and vegetables, S. F. EDWARDS (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32* (*1906*), *pp. 136, 137*.—Observations are given of the bacterial diseases of fruits and vegetables which are noted as occurring during the season covered by the report.

The organism causing the black rot of cabbages and allied plants was found affecting kale, collards, Brussels sprouts, several varieties of cabbage, broccoli, cauliflower, kohl-rabi, ruta-bagas, and turnips. Some varieties of these vegetables were more severely injured than others.

The bacterial blight of the pear, quince, and apple continues to be destructive in Ontario and it was observed in the past season on ornamental varieties of the English hawthorn. This variety which is characterized by its double scarlet flowers had been planted as an ornamental quite extensively, but in July of the past season it was found to be affected by a blight. A study of the disease showed that it was due to the same cause as that producing pear blight (*Bacillus amylovorus*). The common English hawthorn does not appear to be affected so far as the observation has been made, but on account of the susceptibility of this variety a caution is given fruit growers against its planting.

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[a] Contribution à la biologie des plantes phanérogames parasites. Thesis. Paris, 1906, pp. 180, figs. 51.

The cucumber wilt, *Bacillus tracheiphilus*, made its appearance during the season, but as it appeared late in summer did little injury. The author expects to carry on investigations regarding this organism.

A disease of strawberries is briefly described, which is characterized by the appearance of translucent spots which spread throughout the tissue of the green or ripe berries. When a berry is crushed its juice draws out in slimy threads. An organism having a yeast-like appearance has been isolated, and studies are being carried on as to its morphology and life history.

The soft rot of turnips and cauliflowers (*Bacillus oleraceæ*) has again appeared, but at the experiment station caused little loss.

Some injurious fungi found in Ireland, T. JOHNSON (*Econ. Proc. Roy. Dublin Soc., 1 (1907), No. 9, pp. 345–370, pls. 4, figs. 5*).—Attention is called to some of the more important plant diseases observed by the author. On account of the importance of the potato crop, especial mention is made of the potato diseases. Comparatively little loss was caused by *Phytophthora infestans* during the year. On the basis of extended observations the author seems to agree with Matruchot and Molliard that most of the rot of potato tubers is to be attributed to bacteria and not directly to the fungus.

A disease locally known as yellow blight is described, and the author states that while he formerly considered it due to *Sclerotinia sclerotiorum*, he is now satisfied that it is more commonly the work of bacteria than of fungi.

Attention is called to a number of diseases of potatoes which have been considered as caused by different species of bacteria, and while the organisms have many biological differences the author is not satisfied that they are all specifically distinct.

Several forms of potato scab are described. That caused by *Spongospora solani* is of scientific interest rather than economic importance. The scab attributed to *Phellomyces sclerotiophorus* is briefly mentioned, and the fungus is said to be identical in its fertile form with *Spondylocladium atrovirens*.

Notes are given on the winter storage of potatoes and on the heart rot of mangels, onion diseases and their remedies, gooseberry mildew (*Sphærotheca mors-uvæ*), oat smut, and barley leaf streak due to *Helminthosporium gramineum*, the ascospore stage of which, *Pleospora trichostoma*, has been but lately recognized.

[Report of the] department of botany, C. BROOKS (*New Hampshire Sta. Bul. 129, pp. 267–275, pls. 2, fig. 1*).—The season covered by this report was characterized by an excessive rainfall that was favorable to fungus diseases. The department kept a record of those reported and, so far as possible, gathered data in regard to the extent and nature of the injury done. The diseases, which are arranged according to the host plants, are briefly described and suggestions offered for their control. Most of those reported upon were of orchard fruits, grapes, potatoes, melons, and other garden crops.

In addition to investigations on plant diseases, work has been begun to determine the factors that control the formation of fruit buds on apples of the Baldwin variety. The results thus far obtained do not justify any definite conclusions, but it appears from the evidence at hand that it will be possible to produce annual crops on varieties that are accustomed to bear only on alternate years.

Treatment of grain for smut, J. Buchanan (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 176–178*).—A series of experiments to prevent the occurrence of smut was carried on with varieties of wheat and oats which were treated by immersion in dilute formalin, sprinkling with dilute formalin, immersion in hot water, immersion in dilute copper-sulphate solution for 12 hours, immersion in a strong solution of potassium sulphid for 2 hours, and sprinkling with a copper-sulphate solution. All of these treatments were more or less efficient in reducing smut in both the winter wheat and oats, the sprinkling with copper sulphate and immersion in potassium-sulphid solutions being the least efficient.

Another series of experiments was conducted with 2 varieties of oats, the seeds of which ranged from 1 to 5 years old, the object being to ascertain whether the smut spores would lose their vitality sooner than the oats. This experiment has been under way for 3 years, and up to the present has failed to show that the smut has lost its vitality to any appreciable extent.

For 2 years the author has endeavored to prevent smut on barley by treating the seed with formalin at the rate of 1 pt. to 42 gal. of water, but without success.

The stinking smut of wheat (*Bol. Sec. Fomento [Mexico], 2. ser., 6 (1907), No. 8, pp. 635–651*).—A brief report is given on an inquiry made by the agricultural experiment station at Ciudad Juárez relating to the distribution and amount of injury caused by the stinking smut of wheat. For its prevention the treatment of the seed wheat by soaking in copper-sulphate solution, after which the grain is dipped in strong lime water, is recommended.

Investigations on the alteration of grain and fodder, Brocq-Rousseu (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 3, pp. 271–280*).—In a note by G. Bonnier to the Society of Agriculture of France a résumé is given of investigations on an important cause of changes in grain and forage. Grain and forage were found to be attacked by a species of Streptothrix, for which the name *S. dassonvillei* is proposed. The changes caused by the fungus are described at some length, and it is said its presence may be recognized by the peculiar musty odor which it gives to both grain and forage.

By heating grain to 50° C. the micro-organisms are said to be destroyed and the characteristic odor removed. A form of apparatus designed for the rapid treatment of the grain is described.

The formation of intumescences on potato plants, Gertrude E. Douglas (*Bot. Gaz., 43 (1907), No. 4, pp. 233–250, figs. 9*).—While experiments were being carried on in the botanical laboratory of the Cornell University to study the relationship of a soil fungus to potato plants, a number of young shoots were covered with bell jars and in a few days intumescences were formed in great numbers.

The presence of these outgrowths led to an investigation of the subject, and young plants were covered with bell jars and their roots supplied every day with an abundance of water. In from 2 to 5 days the intumescences were formed, usually appearing on the upper surface of the leaf, but in some cases occurring on the lower side also and scattered profusely over the upper part of the stem. To the naked eye they appeared as small greenish-yellow dots, projecting slightly from the surface of the leaf. These rapidly developed in size, became lighter yellow, hemispherical, smooth, and glossy, and after about 24 hours they became whitish, roughened, and projected prominently from the surface. These outgrowths lasted but a short time, and in a day or two they had collapsed and become dry and blackened. A cross-section of the leaf showed that they were due to the hypertrophy of the cells underlying the epidermis.

The swollen cells elongated, finally rupturing the epidermis, and the chlorophyll granules lost their green color, becoming yellowish and finally disappearing entirely.

A study as to the cause of this behavior showed that intumescences are produced on young potato plants from good tubers when transpiration is checked and the roots are rapidly absorbing water. They are formed abundantly both in bright light and in weak light, but they are not produced in total darkness. The abnormal state of turgescence of the hypertrophied cells is attributed to the osmotic action of glucose, assimilated in part by the leaf, but principally supplied to it from the underground tuber, which is richly provided with starch.

Rind disease of the sugar cane, L. Lewton-Brain (*Hawaiian Sugar Planters' Sta., Div. Path. and Physiol. Bul. 7, pp. 44, figs. 16*).—This bulletin, which consists of an address delivered by the author before the Sugar Planters' Association, describes the rind disease of sugar cane and a number of related stem diseases.

The rind disease, which is due to *Melanconium sacchari*, is of considerable importance and from the author's investigation seems to be a widely distributed disease. The first symptoms of its occurrence have been noted in the leaves, which dry up prematurely and turn yellow at the tips, the drying spreading until the whole leaf is dead. The outer leaves are first affected, and the whole tip of the stalk may become dry and dead, in which case attempts may be made to develop some of the buds lower down. By the time the dying of the leaves becomes noticeable other evidences of the disease are present. At this time if the cane be split open it will be found that the normally whitish color of the tissues is changed to a bright or dark red or reddish brown. In the next stage the discolored areas become sunken and lose their color, and later the internodes are shrunken and more or less covered with small, black, hair-like bodies. These are the spore masses which have been put out for the dissemination of the fungus.

In experiments carried on by the author he has found that the disease can be spread by rotten cane, and under field conditions the fungus probably attains access to the plant through wounds which are often caused by leaf hoppers or borers.

In connection with this disease the author discusses the red rot of cane, due to *Colletotrichum falcatum*, attention being drawn to this disease on account of the desire for information and also to correct some ideas regarding the relationship of the two fungi. The author claims that the rind disease and the red rot are quite distinct, and the fungus causing the rind disease is considered to be a wound parasite. However, if the vitality of the cane is lowered in any way, by lack of cultivation, moisture, etc., it becomes liable to attack by this fungus. The red rot is to be the subject of a future communication.

A discussion is given of the relation between *Melanconium sacchari* and *Thielaviopsis ethaceticus*, which causes the so-called pineapple disease of sugar cane. These two fungi are often believed to be different stages of the same fungus, but while inoculation experiments with Melanconium spores under certain conditions result in the production of spores and a diseased condition resembling that due to Thielaviopsis, the converse does not appear to have been demonstrated.

As practical suggestions for combating the rind disease the author recommends the destruction of infected material, the prevention of wounds as far as possible, the selection and disinfection of cuttings, cultivation so as to secure as rapid growth as possible, and the use of resistant varieties.

Some diseases of ginseng, H. H. Whetzel (*Spec. Crops, n. ser., 6 (1907), No. 57, pp. 86–90*).—In an address by the author an account is given of some of the more serious diseases to which ginseng is subject. Of these the most destructive one upon the above-ground parts of the plant is the Alternaria blight. This is due to an undetermined species of Alternaria, and it seriously affects the leaves, stems, and all of the above-ground parts. It has been shown that thorough spraying with Bordeaux mixture will entirely prevent this disease. Until recently the fungus on the wild plant was unknown, but during the summer of 1906 the author discovered it on ginseng plants growing wild in the woods.

Notes are also given on the soft rot of ginseng roots and a Rhizoctonia disease of the stems and roots.

The blossom end rot of tomatoes, Elizabeth H. Smith (*Massachusetts Sta. Tech. Bul. 3, pp. 19, figs. 6*).—Work on the tomato fruit rot was begun by the author in the spring of 1902 and was continued for some time, the present publication giving the results of the investigations.

The diseased condition of the fruit is readily recognized by the occurrence of spots around or at one side of the style. The infected area is slightly sunken, with a regular boundary, and clearly defined by a slightly raised ridge, beyond which the tomato is healthy. The diseased tissues are dry and leathery, of a light grayish-brown color, and on the larger spots rings of a darker color are visible near the boundary. In longitudinal sections through the spots the interior boundaries are as clearly defined as the outer ones.

A microscopical examination of the spots showed the presence of the fungus, which upon cultivation proved to be *Fusarium solani*. This fungus is believed to be the only active parasitic fungus connected with the fruit rot of tomatoes. Species of Macrosporium, Cladosporium, and Alternaria have been found in connection with tomato rots, but the author was unable to induce any of these fungi to grow upon green tomatoes.

In connection with these studies, other diseases of tomatoes were investigated, and a bacterial rot was studied in which the organism was isolated and infection induced by repeated inoculation experiments. One type of the bacterial rot developed characters which were indistinguishable from the characteristic blossom end rot due to Fusarium.

An apple rot due to Volutella, F. L. Stevens and J. G. Hall (*Jour. Mycol., 13 (1907), No. 89, pp. 94–99, pl. 1*).—A black rot of apples closely imitating in appearance that caused by Sphæropsis is described, which is said to have been observed in various sections of North Carolina.

In general the disease may be recognized by the occurrence of black rotten spots upon the fruit. The central and older portions of the decayed region are of an intense coal-black color, while the younger portion of the spots is brownish. A close inspection reveals the presence of slightly elevated pimple-like places on the cuticle. These become larger and more pronounced as the center of the spot is approached. On sectioning an apple through one of these areas the more recently attacked tissues will be found of a brownish color, while the older portions are black. While the decayed portions are softer than the healthy ones, the disease can in no sense be considered a wet rot, the softness being due to a spongy dryness rather than to a watery dissolution.

The organism causing the disease has been isolated and cultivated on various media, but in no case were spores formed on artificial media. When grown on sterilized apple twigs, however, spores were formed in great abundance. Inoculations made from mycelium grown in pure cultures developed the characteristic spots in a few days where the skin of the apple had been injured by pricking, but all attempts to secure inoculations through the unbroken cuticle were without success.

The fungus causing the disease has been determined as *Volutella fructi* n. sp., a technical description of which is given.

Nematodes on grape roots, J. M. Huergo (*Rev. Vitivin. Argentina, 3 (1906), Nos. 21, pp. 312–314; 22, pp. 324–327; 23, pp. 339–342; 24, p. 364; 4 (1907), Nos. 2, pp. 25, 26; 4, pp. 60, 61; 5-6, pp. 79–82*).—A description is given of the effect produced by *Heterodera radicicola* on grapevines, and directions are given for distinguishing the work of nematodes from that of phylloxera, with suggestions of means for combating nematodes.

Some tea and rubber diseases, C. Bernard (*Bul. Dept. Agr. Indes Néerland., 1907, No. 6, pp. 55, pls. 4*).—Descriptions are given of some fungus and insect injuries to *Thea assamica*, *Kickxia elastica*, and *Hevea brasiliensis*.

One of the most destructive diseases of tea is that caused by *Pestalozzia palmarum*. This fungus attacks the foliage, causing discolored spots on the leaves, which finally turn brown. When severely attacked the plant is greatly weakened. A study of the fungus indicated its identity with one that causes severe injury to young cocoanut trees. In fact the fungus appears to spread from cocoanut trees to tea plants. In combating this disease attention should be given the centers of infection, and when they are eradicated the attack on tea plants may be controlled by picking the diseased leaves and an occasional spraying with Bordeaux mixture.

A second disease of tea is that due to *Hypochnus theæ* n. sp., a fungus that forms felted mats and strands over the branches and leaves of the plant. The fungus seems to be a saprophyte, but from its abundance causes serious injury. Pruning the shrubs and the frequent application of Bordeaux mixture will hold this fungus in check.

The third disease of tea plants described is due to *Guignardia theæ*. It is believed that treatments similar to those recommended for the control of the black rot of grapes will be successful in its control.

The disease of Kickxia is due to one of the sooty molds (*Capnodium indicum* n. sp.) following attacks of scale insects, particularly *Lecanium* sp.

Upon Hevea the author reports the attacks of the larvæ of some undetermined borer and a disease of young trees due to mites.

Bordeaux injury, U. P. Hedrick (*New York State Sta. Bul. 287, pp. 103–189, pls. 8*).—On account of the repeated reports of injury to apples through spraying with Bordeaux mixture, the station undertook investigations in the spring of 1906 to determine the cause of Bordeaux mixture injury, conditions favoring the injury, and means for preventing it.

It was found that Bordeaux mixture injury is known wherever Bordeaux mixture is used as a fungicide, and that different species of plants are injured in different degrees, peaches, apricots, and Japanese plums being most susceptible to injury, and common plums, quinces, pears, and apples being injured in about equal degree. Varieties of all the above fruits differ in their susceptibility to injury.

It appears that the amount of the injury to a given species or variety of fruit will depend upon the specific susceptibility of the plant, the solvent properties of cell sap on the copper hydroxid, the permeability of the epidermis of the plant, and the weather conditions following spraying.

The injury on the fruit appears as small, round, black or brown specks, and later the injured specimens become rough and russeted by reason of a ruptured epidermis and layers of dead corky cells. In badly injured specimens the fruits are more or less distorted through shrinkage of the injured portions. A microscopical examination of the injured fruits shows the waxy covering and cuticle of the apple to have been largely destroyed, and such epidermal cells as remain have become much thickened and corky in appearance.

Apples affected by this injury do not keep well, and, after having been kept in cold storage, if the fruit is exposed to the air the affected parts soon become mealy and decay sets in.

Upon the leaves the injury is first shown by the appearance of brown spots of various shapes and sizes. Quickly following this the leaf tissues turn yellow and the leaves fall. When the injury is only slight the yellowing may not appear nor the leaves drop.

It was found in the investigations that Bordeaux mixture has a particularly harmful effect in destroying the tissues of the apple blossom.

Injuries from arsenites, frost, fungi, mites, and the action of drops of water on foliage are somewhat similar to the injury caused by Bordeaux mixture and are frequently confused with it.

The experiments carried on at the station show conclusively that the Bordeaux mixture on the fruit and foliage caused the trouble described above. The toxic substance seems to pass through the stomata and the basal cells of the plant hairs into the cellular tissue of the fruit, the black specks characterizing the first stage of the Bordeaux russeting being usually formed about a stoma. No conclusion could be reached as to how the toxic ingredient finds its way into the cellular tissues of the leaves, but since the dead spots are nearly always under heavy Bordeaux mixture stains it is believed that the dissolved salts enter osmotically into the cells of the leaf surface.

Different varieties of apples were found to vary in respect to the injury by Bordeaux mixture, and immunity to injury by Bordeaux mixture does not correspond with immunity to the apple scab fungus. Early spraying and wet weather favor the development of this injury, and in experiments in which the quantities of copper sulphate and lime were varied it was found that the more the copper sulphate the greater the injury, although an excess of lime did not prevent or greatly lessen the injury. It is recommended that in practice less copper sulphate should be used and spraying should be done in moderation, so as not to have the trees drip heavily. So far as possible the Bordeaux mixture should be applied only in dry weather, and equal amounts of lime and copper sulphate should be used. The author calls attention to varieties which are nearly immune to attacks of the scab fungus and upon these light applications of Bordeaux mixture should be made in average seasons.

A bibliography of the subject completes the bulletin.

Cause and control of Bordeaux injury, F. H. Hall and U. P. Hedrick (*New York State Sta. Bul. 287, popular ed., pp. 16, pls. 2*).—A popular edition of the above.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Statistics of hunting licenses, T. S. Palmer (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 54, pp. 24, figs. 2*).—From an examination of the statistics regarding hunting licenses it appears that in 1905, 10,000 nonresident and 511,000 resident licenses were issued to hunters in the United States and Canada and that the income from these licenses was more than $600,000. It is believed that a system of license fees is the only method of putting game protection upon an independent and self-sustaining basis. Notes are given on the changes in fees, statistics of resident and nonresident licenses, number of licensed hunters in the United States, cost of collection, and restrictions on the use of license funds.

Directions for the destruction of wolves and coyotes, V. Bailey (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 55, pp. 6*).—This is a condensed form of information already noted from another source (E. S. R., 18, p. 749).

Carbon disulphid as a squirrel killer, L. F. Henderson (*Idaho Sta. Press Bul. 11, n. ser., pp. 4*).—Experiments to determine whether a large or small amount of carbon disulphid was more economic and satisfactory in destroying ground squirrels were somewhat unsatisfactory, for the reason that apparently the minimum poisonous dose was not determined. A half tablespoonful is not always sufficient, and in some cases 2 tablespoonsful were used. Where a sufficient amount of carbon disulphid is used it apparently requires not more than 2 or 3 hours to destroy the squirrels.

Birds useful in the war against the cotton boll weevil, H. W. HENSHAW (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 57, pp. 4*).—It has been found that 38 species of birds eat the cotton boll weevil to a greater or less extent. In this connection special mention is made of orioles, the nighthawk, and various kinds of swallows and martins.

Value of swallows as insect destroyers, H. W. HENSHAW (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 56, pp. 4*).—Attention is called to the agency of swallows in the destruction of boll weevils and other injurious insects. Notes are given on the tree swallow, barn swallow, bank swallow, cliff swallow, and purple martin. The author suggests a simple means of protecting these birds and encouraging their nesting.

Index-catalogue of medical and veterinary zoology, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 39, pt. 17, pp. 1209-1304*).—A list of titles arranged alphabetically under authors' names from Maartens to Martirano.

Executive report of the Illinois State entomologist, S. A. FORBES (*Exec. Rpt. Ill. State Ent., 1905–6, pp. 27*).—During the years 1905 and 1906 great advance has been made in devising practical remedies for the control of insects. Nevertheless, enormous losses were caused by insects in Illinois, particularly by corn insects and San José scale. The work of the entomologist in the study of remedies for the corn aphis has been quite successful. Progress is also reported in devising means for combating white grubs, San José scale, and cottony maple scale.

In 1906, 239 nurseries were inspected at an average cost of $4.77, which, according to the State law, is charged against the nurseryman. A list is given of the nurseries inspected in Illinois.

[Report of the] department of entomology, E. D. SANDERSON (*New Hampshire Sta. Bul. 129, pp. 258–266*).—Reference is made to the entomological equipment and collection of the station and to insects received for identification. A list is given of the publications of the entomologist during the years 1905 and 1906.

A brief account is also given of the work of the station on the brown-tail moth, gipsy moth, codling moth, apple maggot, and insect pests of gardens and shade trees.

[Report of] the professor of entomology and zoology, C. J. S. BETHUNE (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 42–54*).—Brief mention is made of the instruction work in entomology at the agricultural college during 1906, and of correspondence, demonstrations, and publications on entomological subjects.

In field experiments in treating oyster-shell bark-louse, lime-sulphur wash gave the best results followed in efficiency by kerosene emulsion. In combating root maggots, the best results were obtained from an application of pyrethrum mixed with 4 times its weight of flour. Carbolic-acid emulsion also gave good results. Crude petroleum, pure and in emulsions, was tested as a spray on apple, pear, plum, and cherry trees, and black currants. It was found that in winter it is harmless to tender varieties of trees and is fully as effective as kerosene. In summer considerable danger attends its use.

Thirty-seventh annual report of the Entomological Society of Ontario (*Ann. Rpt. Ent. Soc. Ontario, 37 (1906), pp. 120, pls. 7, figs. 36*).—The forty-third annual meeting of the society was held at Guelph, Ontario, October 10 and 11, 1906, and the present report contains an account of the proceedings. The ravages of the codling moth and the natural parasites of this pest were discussed by J. Fletcher and W. Brodie (pp. 3–15). Brief notes on the insects of the year in various districts of Ontario were given by C. H. Young et al. (pp. 15–19). Similar notes on injurious insects were presented by C. J. S. Bethune (pp. 45–56) and J. Fletcher (pp. 81–89).

Other matters discussed at the meetings included the insect galls of Ontario, insects injurious to linden, locust mite, oyster-shell bark-louse, bean weevil, San José scale, and various species of hemiptera.

Report on injurious insects and plant diseases for 1906, W. M. Schoyen (*Beretning om Skadeinsekter og Plantesygdomme i Land- og Havebruget 1906. Christiania: Grondahl & Sons, 1907, pp. 30, figs. 14*).—During the year under report attention was given to fruit flies, grain aphis, wheat rust, and a number of other insect pests and fungus diseases of cereals, clover, and garden crops, particularly cabbage, potatoes, tomatoes, and melons. The depredations of certain fruit pests are also noted, particularly pear blister-mite, currant sawfly, and *Lecanium ribis*.

Entomological work of the state agricultural institute in 1906, Poskin (*Bul. Agr. [Brussels], 23 (1907), No. 2, pp. 115–161*).—A general outline is given of the conditions under which specific insecticide treatments are indicated for the control of injurious insects. Particular attention is given to suitable insecticides for the treatment of biting insects. The formulas commonly proposed for Paris green, London purple, and arsenate of lead are discussed and recommendations are given regarding the time and method of application of these insecticides.

The grasshopper problem and alfalfa culture, F. M. Webster (*U. S. Dept. Agr., Bur. Ent. Circ. 84, pp. 10, figs. 8*).—During the past few years serious depredations have been reported from the attacks of grasshoppers on alfalfa. The species chiefly concerned are *Melanoplus differentialis* and *M. bivittatus*. Notes are given on the habits and life history of these grasshoppers. About 100 species of birds are known to feed upon them, and they are also held in check to some extent by the attacks of insect parasites and a fungus disease.

Wherever the grasshoppers are abundant, however, it is necessary to adopt artificial means of repression. The best means are the destruction of the eggs by plowing or harrowing, catching the young grasshoppers in hopperdozers, and the use of poisoned baits, particularly Criddle mixture.

The cotton bollworm, F. C. Bishopp and C. R. Jones (*U. S. Dept. Agr., Farmers' Bul. 290, pp. 32, figs. 4*).—The life cycle, food plants, seasonal history, and injuries caused by the bollworm are briefly outlined. In combating this pest the authors recommend thorough fall or winter plowing, the use of early varieties of cotton, heavy fertilization, early planting, and frequent cultivation.

The spring grain-aphis, F. M. Webster (*U. S. Dept. Agr., Bur. Ent. Circ. 85, pp. 7, figs. 3*).—The general appearance, seasonal history, food plants, outbreaks, and natural enemies of this pest are briefly noted. The author believes that the pest is usually held in check by its natural enemies and by unfavorable climatic conditions. Late sowing is suggested as a means of preventing an attack of the aphis upon fall grain and rolling or brushing are recommended for reducing the infestation of grain.

The corn leaf-aphis and corn root-aphis, F. M. Webster (*U. S. Dept. Agr., Bur. Ent. Circ. 86, pp. 13, figs. 4*).—It is uncertain whether there is any genetic connection between these 2 plant lice. The root-aphis is the only one which causes serious trouble. This insect is described in its various stages and notes are given on its life history.

In combating the pest the best results are had from adopting a system of crop rotation, stirring the soil after plowing and before cultivating the crop, plowing the soil in the fall or winter, making heavy applications of barnyard manure, and treating the seed corn with a mixture of wood alcohol and oil of lemon. The last-named remedy was advised by Professor Forbes of the Illinois Station.

The strawberry root-louse: Life history and remedies, C. O. HOUGHTON (*Delaware Sta. Circ. 2, pp. 4*).—The life history of this insect is briefly outlined. In controlling the pest good results are to be expected from burning over old strawberry beds, dipping infested plants in tobacco tea prepared by boiling for one-half hour 1 lb. of tobacco stems in 1 gal. of water, or fumigation with hydrocyanic-acid gas.

New hemipterous fruit pests in Britain, F. V. THEOBALD (*Jour. Econ. Biol., 2 (1907), No. 1, pp. 14-25, pls. 2*).—A considerable variety of leaf-hoppers have caused serious damage to all kinds of orchard trees and bush fruits. The author gives an account of the biology of *Typhlocyba quercus*, *Chlorita flavescens*, and *C. viridula*. Several natural enemies and parasites of these pests have been collected. The nymphs of these leaf-hoppers may best be destroyed, in the opinion of the author, by treating infested trees or shrubs with kerosene emulsion containing 3 gal. of oil to 100 gal. of water.

Spraying for the codling moth, J. W. LLOYD (*Illinois Sta. Bul. 114, pp. 375-429, figs. 5*).—Orchardists throughout the State of Illinois follow the practice of spraying their orchards 3 times a year, using Bordeaux mixture and Paris green, or some other arsenical, for the purpose of combating apple scab and codling moth at the same time. The first application is usually directed against apple scab, but Paris green is added to the mixture in order to poison canker worms. The second application is commonly made immediately after the petals fall and the third a week or 10 days later.

The subject of combined spraying for codling moth and apple scab was carefully investigated by the author. It appears that the first application for the codling moth should be timed preferably with reference to the most advanced young apples rather than to the average development of the entire setting. It is concluded that spraying for the first brood of the codling moth may take place as soon as most of the petals have fallen and should be completed within 7 days from that date. It is desirable to use at this time a large amount of spraying material and apply it under high pressure. This treatment is aimed at the first brood of codling moth and the calyx end of the apples should be well filled with the insecticide.

Since the larvæ of the second brood continue to appear during a period of 4 or 5 weeks, it is necessary to make repeated applications in order to keep them fairly in check. If the first treatment is carefully done subsequent applications will be less important.

The use of a simple mixture of Paris green and water is not recommended for the reason that it injures the foliage and causes dropping of the apples. The best results are obtained from the use of Paris green in Bordeaux mixture at the rate of ¼ lb. to 50 gal. of water, or 25 oz. of lead acetate and 10 oz. sodium arsenate in 50 gal. of water.

Two common scale insects, C. O. HOUGHTON (*Delaware Sta. Circ. 3, pp. 6, fig. 1*).—A brief account is given of the life history, habits, and food plants of the oyster-shell scale and scurfy scale. In combating the oyster-shell scale the author recommends the application of kerosene emulsion shortly after the emergence of the young. The same remedy may also be used for scurfy scale.

The San José and other injurious scale insects of Tennessee with methods for their control, G. M. BENTLEY (*Tennessee Sta. Bul., Vol. XIX, No. 2, pp. 11–34, figs. 23*).—A popular review is given of the history, introduction, distribution, habits, and life history of the San José scale with notes on its food plants and the extent of its injuries. Boiled lime-sulphur wash is recommended as the best remedy for this pest from a standpoint of both cheapness and efficiency. Brief directions are given for preparing and applying remedies for the San José scale, and short notes on the oyster-shell scale, scurfy scale, cottony-maple scale, rose scale, and apricot scale.

Capnodis tenebrionis, a fruit pest, LATIÈRE and GUÉNAUX (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 3, pp. 268–271*).—This insect attacks the trunks of the peach and cherry trees. It is difficult, if not impossible, to prevent the deposition of the eggs on the bark by the use of sticky substances. It is suggested that the larvæ in the trunks be destroyed by the use of wires inserted into the tunnels.

Description of a new genus and species of scale insect on the olive, A. BERLÉSE and F. SILVESTRI (*Redia, 3 (1905), No. 2, pp. 396–407, figs. 18*).—*Euphilippia olivina* is described as new and notes are given on its life history. This scale insect lives upon the olive and has been found in large numbers in several localities. It appears that there is but one brood annually and that the eggs are laid in the month of May.

A probably effective method of destroying Ceratitis capitata and Rhagoletis cerasi, A. BERLÉSE (*Redia, 3 (1905), No. 2, pp. 386–388*).—The gratifying success had by the author in combating the olive fly by a mixture containing honey, molasses, glycerin, and an arsenical leads him to believe that the same method may be used effectively against fruit flies.

The locust borer and methods for its control, A. D. HOPKINS (*U. S. Dept. Agr., Bur. Ent. Circ. 83, pp. 8, figs. 4*).—A brief statement is made regarding the damage caused by this insect, the means by which its attacks may be recognized, and measures for its control. It is recommended that locusts be cut for timber or in thinning operations between October 1 and April 1. If it is desired to destroy badly infested trees they should be cut in May and June when they contain the greatest number of the borers. Beneficial results have been noted as a result of spraying trunks and branches of trees with kerosene emulsion. Some attention has also been given to breeding a resistant race of trees.

Pinhole injury to girdled cypress in the South Atlantic and Gulf States, A. D. HOPKINS (*U. S. Dept. Agr., Bur. Ent. Circ. 82, pp. 4, fig. 1*).—Observations were made on 300 cypress trees for the purpose of studying the various species of insects which are connected with injury to the wood and bark of living or dead trees. The principal injury appeared to consist of pinholes in the sapwood and heartwood caused by ambrosia beetles and pin borers. The most injurious species is *Platypus compositus*. In combating these pests the author recommends that girdling operations be carried on in October and November and that worthless gum or cypress trees be left as traps in the proportion of 1:50–70 trees to be girdled.

The spruce-gall and larch-blight diseases caused by Chermes, and suggestions for their prevention, E. R. BURDON (*Jour. Econ. Biol., 2 (1907), No. 1, pp. 1–18, figs. 2*).—A general study was made of the life history and appearance of the various developmental stages of Chermes on spruce and larch. The complicated life history of these insects is shown in a tabular form. Many remedies have been tested in preventing the ravages of spruce-gall insects, but, according to the author's experience, the best results are to be expected from the use of a comparatively weak kerosene emulsion. If this remedy is applied in spruce timber it will also be necessary to treat larch in the immediate neighborhood to prevent the reinfestation of the spruce.

Chermes of Colorado conifers, C. P. Gillette (*Proc. Acad. Nat. Sci. Phila., 59 (1907), No. 1, pp. 3–22, pls. 11*).—The species of Chermes found on conifers in Colorado are described in detail, several of them being new. Notes are also given on the habits of these species.

An ecological and experimental study of Sarcophagidæ with relation to lake beach débris, W. B. Herms (*Ohio State Univ., Contrib. Dept. Zool. and Ent., No. 24, pp. 39; reprinted from Jour. Expt. Zool., 4 (1907), pp. 45–83, figs. 7*).—After the occurrence of storms along the shores of the Great Lakes there is a greater or smaller amount of vegetable and animal débris left upon the beach. The author made a study of the agency of insects, particularly flies of the family Sarcophagidæ, in the destruction of this organic material. It appears that the most common members of this family, particularly *Lucilia cæsar*, are most effective in destroying the animal and vegetable matter which would otherwise become a source of nuisance.

Experiments were carried on to determine the reaction of the larvæ of these flies to chemical substances, light, and gravity.

The danger of flies, A. E. Shipley (*Sci. Prog. Twentieth Cent., 1 (1907), No. 4, pp. 723–729*).—Attention is called to the importance of flies in the contamination of various food products and in the distribution of infectious diseases.

Some practical directions for making oil emulsions, C. L. Penny (*Delaware Sta. Circ. 1, pp. 6*).—Formulas are given for the preparation of soap solutions, mixtures of kerosene or crude oil and rosin oil, and other mixtures containing proprietary preparations of oils in combination with other standard forms of kerosene or crude oil. It has been found that some of the proprietary soluble oils separate and it is, therefore, recommended that they be thoroughly mixed before using.

Control of insect pests and diseases of Maryland crops, J. B. S. Norton and T. B. Symons (*Maryland Sta. Bul. 115, pp. 145–210, figs. 38*).—A general description is given of the kinds of damage caused to crops by insects and fungus diseases. Formulas are presented for the preparation of standard insecticides and fungicides and directions are given for their application. A considerable portion of the bulletin is occupied with an alphabetical list of cultivated crops with notes on their common insect and fungus enemies and remedies for the control of these pests.

Spraying the apple orchard, E. D. Sanderson, T. J. Headlee, and C. Brooks (*New Hampshire Sta. Bul. 131, pp. 11–56, figs. 36*).—The present status of the apple industry in New Hampshire is briefly outlined. The life history of the codling moth is described and a summary is presented of spraying experiments in New Hampshire during 1906. In the spraying experiments reported by the author it was found that at the average price of winter apples a profit of $1 to $1.35 per tree may be secured by 2 sprayings for the codling moth. Attention is also called to the value of scraping loose bark from the trees in order to destroy the favorable locations for the hibernation of the codling moth.

When arsenicals are mixed with Bordeaux mixture, apple scab and fruit spot are also largely held in check.

Spraying, L. R. Taft (*Michigan Sta. Spec. Bul. 37, pp. 32, figs. 10*).—The recommendations brought together in the present bulletin concern measures for the control of the San José scale, potato blight, black rot, and mildew of grapes, and other diseases. The sulphur and lime mixture is recommended as the most efficient and cheapest remedy for the control of the San José scale and it also has the advantage of checking a number of fungus diseases. Practical suggestions are made regarding the selection of spraying machinery and the time and method of application of insecticides and fungicides to orchard and other crops.

Spraying calendar, L. R. TAFT and C. D. SMITH (*Michigan Sta. Spec. Bul. 36, folio*).—Formulas are given for the preparation of standard insecticides and fungicides and dates are recommended for the application of these materials in the control of the chief insects and fungus diseases of various cultivated plants.

The biology of Litomastix truncatellus, F. SILVESTRI (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 6 (1906), pp. 1–51, pls. 4, figs. 13*).—This species was taken as an example of hymenopterous parasites and all features of its biology were studied in detail, beginning with the development of the young parasite in the egg of *Plusia gamma*, its host.

According to the author's observations the larval life of the parasitized Plusia is 3 or 4 days longer than that of healthy larvæ and the larva reaches a greater size than is normally the case. The generations of the parasite correspond strictly with those of the host insect.

Parasites of leaf-hoppers. Leaf-hoppers, R. C. L. PERKINS and C. W. KIRKALDY (*Hawaiian Sugar Planters' Sta., Div. Ent. Bul. 4, pp. 66*).—The descriptive material contained in this bulletin is based almost entirely on studies of leaf-hoppers and their parasites collected by Koebele in Arizona. The new species and genera of hymenoptera noted in the report belong chiefly to the family Dryinidæ, but other families are represented. A number of new genera and species of leaf-hoppers are also described.

Hosts of insect egg parasites in North and South America, A. A. GIRAULT (*Psyche, 14 (1907), No. 2, pp. 27–39*). A classified list is given of host insects the eggs of which are attacked by true egg parasites, together with a bibliography relating to the subject.

[Report of] the lecturer in apiculture, H. H. ROWSOME (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), p. 211*).—An experiment was tried in protecting colonies of bees in order to increase the heat inside the colonies during the time of the most active manufacture of wax. It has been found that in exceptionally mild winters there is little benefit from the use of too expensive and elaborate arrangements of protecting bees.

Breeding bees by selection, F. W. L. SLADEN (*Brit. Bee Jour., 35 (1907), No. 1296, pp. 164, 165*).—Attention is called to the difficulty of carrying on breeding experiments with bees, particularly in being sure of the ancestry of drones selected for this purpose. In most localities it is practically impossible to find for breeding experiments an isolated place in which no other bees are raised. The best system of selection appears to be the one in which dependence is placed upon the color of the bees.

A method of swarm control, W. C. LYMAN (*Amer. Bee Jour., 47 (1907), No. 20, pp. 411–413, figs. 4*).—A description is given of a device tested by the author in which swarming is controlled in a satisfactory manner. A brood chamber is connected with the main hive by means of a passage which opens in front near the entrance to the main hive. The bees are thus given additional room for rearing the brood and for accommodating the increasing colony without the necessity of swarming.

Handmade comb foundation, J. SUREAUD (*Apiculteur, 51 (1907), No. 3, pp. 115–120*).—The difficulties and advantages of preparing comb foundation at home are briefly outlined by the author, who has had considerable experience along this line. It has been found that when a thick foundation is given to the bees they are able to draw it out to the normal thickness without losing any of the wax. This process takes place rapidly and foundations prepared by hand in the manner recommended by the author are said not to break or bend.

Tussah or wild silk, W. PONTIUS (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2863, pp. 5–7*).—Silk from cocoons, the worms of which were fed on oak leaves, is referred to as a wild silk. A brief account is presented of the extent of the industry in this material.

The weight of silkworm cocoons, G. TRENTIN (*Rivista, 4. ser., 13* (*1907*), *No. 9, pp. 207–211*).—Attention is called to the discrepancies in the average weights given by different authorities for silkworm cocoons of the same race. It is indicated that these weights are sometimes stated too high.

FOODS—HUMAN NUTRITION.

Iron in food and its functions in nutrition, H. C. SHERMAN (*U. S. Dept. Agr., Office Expt. Stas. Bul. 185, pp. 80*).—This report includes a general discussion of iron in food and its functions in nutrition, together with the results of 3 metabolism experiments in which the balance of income and outgo of nitrogen, iron, phosphorus, calcium, and magnesium were determined, as well as the results of 2 dietary studies undertaken with special reference to the iron content of the food consumed. Estimates are also given of the iron taken per man per day in 20 dietary studies made under the auspices of this Office in different parts of the country and reported in earlier bulletins. The experimental results obtained are discussed in the light of previous investigations and the report as a whole constitutes a summary of data on iron and its functions in food.

According to the author, the body of a man weighing 60 to 70 kg. contains 3 to 3.5 gm. of iron, the greater part of which exists as a constituent of the hemoglobin of the red blood corpuscles, while much of the remainder is contained in the chromatin substance of the cells. "Iron is probably an essential constituent of all nucleo-proteids. The iron-compounds of the body are therefore very prominent in the general metabolism and oxidative processes of the organism as a whole, and apparently also in the particular activities of the secreting and other specialized cells.

"Notwithstanding the constant and varied activities of the iron compounds in the body, the amount of iron so metabolized as to be eliminated is small—in fasting experiments, 7 to 8 mg.: in metabolism experiments with restricted diet, 5.5 to 12.5 mg. per day. Hence the daily waste of iron probably amounts to only 2 or 3 parts per 1,000 of that contained in the body. The small amounts of iron katabolized and eliminated are normally replaced by the organic iron compounds of the food. The food-iron is absorbed from the small intestine, deposited mainly in the liver, spleen, and bone marrow, and is finally eliminated almost entirely through the intestinal walls, only a very small proportion leaving the body by way of the kidneys.

"Approximate estimates of the iron contents of 20 American dietaries regarded as typical show a minimum of 7 mg. per man per day in the case of a negro family in Alabama and a maximum of 35 mg. in the food of Maine lumbermen at very active work combined with exposure to cold. The majority of dietaries furnish 11 to 19 mg. of iron per man per day. Throughout the 20 dietaries the amounts of iron run nearly parallel with the amounts of protein, the milligrams of iron per 100 gm. of protein in the diet varying only from a minimum of 15 to a maximum of 20. The relation of iron to protein is thus practically the same in ordinary mixed diet as in meat, so that the addition of meat to a mixed diet does not make it richer in iron relatively to protein.

"Increase of iron in the diet without a corresponding increase of protein is readily accomplished by the use of vegetables, fruits, and the coarser mill products of the cereal grains. In the experimental dietary here reported the free use of such foods with milk but without meat or eggs resulted in an increase of 30 per cent in the iron content of the diet, while the protein, the fuel value, and the cost remained practically the same as in the ordinary mixed diet obtained under the same market conditions."

The distribution of phosphorus in food materials, BALLAND (*Jour. Pharm. et Chim., 6. ser., 25 (1907), No. 1, pp. 9–12*).—A brief summary of results of a large number of determinations of the phosphorus content of food materials. According to the author the phosphorus estimated as P_2O_5 varied from 0.65 to 1.11 per cent in commercial wheat. The same values were found in oats. In maize, millet, barley, rye, and buckwheat the maximum was about 0.8 per cent. No values were determined for unpolished rice, but in the polished material the proportion was 0.25 per cent. Data are also given regarding the distribution of phosphorus in milling products, a number of vegetable foods, fruits, meat, cheese, and other foods.

The distribution of sulphur in foods, BALLAND (*Jour. Pharm. et Chim., 6. ser., 25 (1907), No. 2, pp. 49–51*).—A summary of the results of determinations of sulphur in cereals, vegetables, legumes, and fruits. The amount of sulphur in wheat ranged from 0.027 to 0.072 per cent, or, estimated as sulphuric acid, from 0.084 to 0.222 per cent.

Breakfast foods: Their chemical composition, digestibility, and cost, R. HARCOURT (*Jour. Soc. Chem. Indus., 26 (1907), No. 6, pp. 240–243*).—In addition to experiments on the digestibility of breakfast foods when forming a part of a simple mixed diet, which have been noted from another publication (E. S. R., 18, p. 460), data are given regarding the effects of cooking oat and wheat meals, rolled oats, and wheat farina for periods of 20 minutes, 2, 5, and 8 hours.

According to the author, the farinas, etc., "are more readily broken down through the action of heat than the oatmeals. With the latter there was only 14.95 per cent solids in the extract at the end of 20 minutes' cooking, whereas with farina, 27.4 per cent was soluble. A portion of the extract obtained from the wheat boiled for 20 minutes was hydrolyzed, when it reduced copper equivalent to 23.85 per cent of dextrose or 21.46 per cent of starch. After hydrolysis a portion of the extract taken from the meal boiled for 8 hours reduced copper equivalent to 37.65 per cent of dextrose, or 33.88 per cent of starch."

The digestibility of these foods when cooked for 20 minutes and for 8 hours was also studied with the results which are given in the following table:

Digestibility of rolled oats and wheat farina cooked for long and short periods.

Kind of food.	Organic matter	Protein	Fat	Carbohydrates.
	Per cent	*Per cent*	*Per cent.*	*Per cent*
Rolled oats (cooked 20 minutes)	94.2	81.5	92.5	98.0
Rolled oats (cooked 8 hours)	95.4	84.3	94.6	98.3
Wheat farina (cooked 20 minutes)	95.5	79.3	94.9	98.3
Wheat farina (cooked 8 hours)	95.3	79.4	95.6	95.5

"It is evident that the length of time the meal was cooked did not very materially influence the percentage amount digested. It is, of course, possible that less energy may have been expended in digesting that which was cooked the longer time; but no figures could be procured on this point."

Breakfast foods, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 63–68*).—The data reported are noted above.

The proteid content of wheat as an index to its bread-making qualities, A. J. PATTEN (*Rpt. Mich. Acad. Sci., 8 (1906), pp. 75–77*).—The summary of data prepared led to the conclusion that no hard and fast rule can be laid down for determining the bread-making value of wheats and flours. The most useful chemical tests in the author's opinion are the determination of the total protein and the determination of gliadin.

"Midzu ame," a new foodstuff, O. VON CZADEK (*Ztschr. Landw. Versuchsw. Österr., 9 (1906), No. 9. pp. 891, 892*).—An analysis is reported of a Japanese food product prepared usually from rice by the action of malt. The specimen analyzed was in appearance and taste not unlike honey.

The behavior of several lichen carbohydrates in the human body and their use in diabetes mellitus, E. POULSSON (*Upsala Läkareför. Förhandl., n. ser., 11 (1906), Sup. XIV, pp. 25*).—The carbohydrates of *Cetraria islandica* and *Cetraria nevalis* were studied and found to be similar, consisting in part of lichenin or a similar substance, which on hydrolysis gives δ-glycose and in part of hemicelluloses, which are probably anhydrids of δ-mannose and δ-galactose. Experiments showed that about 46 to 49 per cent of the carbohydrates of a sort of bread made from Iceland moss (*Cetraria islandica*) was digested. A similar bread made from *Cetraria nevalis* caused such disturbances that the experiment had to be discontinued.

Use of fruit as food, C. F. LANGWORTHY (*U. S. Dept. Agr., Farmers' Bul. 293, pp. 38, fig. 1*).—A revision and extension of an article of similar title previously noted (E. S. R., 18, p. 259). The table of composition of fruit and fruit products has been materially extended, and considerable new matter has been incorporated in the text. The principal topics discussed are the wild and cultivated fruits, market conditions and fruit supply, composition, color and flavor of fruits, ripening and its effect on composition, digestibility of fruit, cooking and its effects on fruit, jelly making, handling and storing fruit, and the hygiene of fruit.

A summary of statistical data regarding the present state of the fruit industry in the United States shows that there has been a decided gain both as regards fresh and preserved fruits, and there are reasons for believing that even the present development represents only a beginning. "This being the case, it is easy to understand why the agricultural experiment stations have devoted so much of their time to the study of fruit products, the marketing of fruit, and related problems, and why the place of fruit and fruit products in the diet and their value as food should be regarded as an important subject for investigation."

Banana flour, C. DRIEBERG, (*Queensland Agr. Jour., 18 (1907), No. 1, pp. 25–28*).—A summary of data from the Ceylon Tropical Agriculturist in which statistics of the commercial value of banana flour, the possible yield, different methods of manufacture, and similar topics are summarized.

In the author's opinion there is no great future for this industry, as the prices at which banana flour can be sold are not profitable. He believes that it has a marked value in infant and invalid dietetics, though it "is at a decided disadvantage when competing with cereal flours, which are much more cheaply produced."

Fruit juice statistics, 1906 (*Ztschr. Untersuch. Nahr. u. Genussmtl., 12 (1906), No. 12, pp. 721, 722*).—A summary of data regarding the character of commercial fruit juice for the year 1906 made up of articles on raspberry juice, by P. Buttenberg, H. Hempel, A. Friedrich, and H. Lührig; on blueberry, cherry, currant, gooseberry, raspberry, and blackberry juice, by E. Thamm and A. Segin;

on raspberry, strawberry, currant, and cherry juices and sirups, and on lemon and apple juice, by A. Juckenack, G. Büttner, and H. Prause; and on raspberry, cherry, currant, blueberry, and strawberry juice, by E. Baier and P. Hasse.

Judging the quality of raspberry jam, H. Kober (*Ztschr. Öffentl. Chem., 12 (1906), No. 20, pp. 393–398*).—Samples of raspberry jam made under the author's supervision were analyzed, and in his opinion it is not possible to fix upon maximum and minimum figures for the proportion of insoluble material in such goods, since there is no uniformity among manufacturers regarding the proportion of berries and sugar used and the degree of cooking.

Blueberry juice and the reaction which it shows under given conditions, W. Plahl (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 1, pp. 1–5*).—Blueberry juice, when treated with lead acetate, gave, after the removal of the lead, proper filtration, and concentration, a blue color when heated with hydrochloric acid and alcohol. The juice of a number of other species of vaccinium also gave this reaction, and the author believes that it is due to the presence of a glucosid, but further investigations are needed to prove this. The color reaction could not be obtained with the juice of cherries, grapes, elderberries, and currants. Data are also given regarding the composition of commercial blueberry juice.

The food and medicinal value of ice cream, J. A. Wesener (*Amer. Food Jour., 2 (1907), No. 2, pp. 31–33*).—A paper with discussion in which the nutritive value of ice cream, the comparative merits of pasteurized and sterilized milk for ice-cream making, and other questions are considered.

Buttermilk as a food and remedial agent, W. Gerassimowitsch (*Vrach [St. Petersb.], 5 (1906), pp. 578–581, 606–608; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 1, p 34*).—On the basis of observations with sick and healthy children, the author concludes that buttermilk obtained from sour cream is valuable as a food and remedial agent, but is not equal to woman's milk.

Analyses of Spanish paprika, A. G. Stillwell (*Jour. Amer. Chem. Soc., 28 (1906), No. 11, pp. 1603–1605*).—Standards are proposed for pure pepper (sweet) of high grade, for second grades containing some seeds, and for the lowest grade peppers containing practically nothing but seeds and stems. Olive oil is added to heighten the color of red peppers, and on this account the author considers that some of the samples which he examined containing more than 12 per cent total ether extract should be looked upon as suspicious.

Concerning the fruit of Capsicum annuum, A. Nestler (*Ztschr. Untersuch. Nahr. u. Genussmtl., 11 (1906), No. 11, pp. 661–666, pl. 1*).—Studies are reported of the crystals found in the secretory ducts and of the proteid and calcium oxalate crystals found in *Capsicum annuum*.

According to the author, the paprika plant is rich in calcium oxalate, the substance being found in considerable quantity even in the cotyledons of the young plant.

Studies in experimental alcoholism, R. Hunt (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 33, pp. 43*).—From an extended series of experiments with small animals the author concludes that in some respects "the action of alcohol as a food is different from that of carbohydrates, and . . . that in all probability certain physiological processes in 'moderate drinkers' are distinctly different from those in abstainers." It was found that animals to which alcohol had been administered for some time in doses far too small to cause symptoms of intoxication or anatomical lesions which could be detected by present methods acquired an increased susceptibility to a definite poison, acetonitrile.

"It is believed that these experiments afford clear experimental evidence for the view that extremely moderate amounts of alcohol may cause distinct changes in certain physiological functions and that these changes may, under certain circumstances, be injurious to the body."

Researches on the nitrogenous constituents of malt which are soluble in cold water, and are not coagulated on boiling (*Trans. Guinness Research Lab., 1 (1906), pt. 2, pp. 167–283*).—A number of papers on various questions concerning the nitrogenous constituents of malt are reported and discussed, the investigations as a whole having relation to the use of malt in brewing.

The excretion of boric acid from the human body, H. W. Wiley (*Jour. Biol. Chem., 3 (1907), No. 1, pp. 11–19*).—From the author's investigations on borax, some of which have been reported in full (E. S. R., 16, p. 182), the general conclusion is reached that "the total quantity of boric acid excreted in the feces and perspiration is not much if any over 3 per cent of that administered during the ordinary period of observation. It is evident, therefore, that even including these quantities with those which are excreted in the urine not over 85 per cent of the total amount of boric acid exhibited in these experiments is in the three excretions mentioned."

The possibilities of the excretion of borax in milk were studied with nursing women. The data obtained indicate that "appreciable quantities of boric acid administered to the mother are found in the lacteal secretion. The quantity is quite variable and increases or decreases without much relation to the exact date of administration of the preservative. It is evident that the residue of boric acid which is stored in the body may at any time be expected to appear in the milk. Properly this investigation should have been completed by a study of the animal body itself after the administration of boric acid for a certain period to determine in what organs the part which escapes excretion is principally stored. Theoretically, from the results of the metabolic experiments, a large part of it would be found in the bones, or other phosphatic tissues, since it was seen that the administration of the boric acid largely increased the excretion of phosphorus. It is our intention in the near future to complete the experiment by feeding animals borax or boric acid for a period and then examining their bodies to determine the quantity of borax stored and its distribution."

Formic acid as a preservative, G. Lebbin (*Chem. Ztg., 30 (1906), No. 82, pp. 1009–1011*).—Strong acetic acid is known to be harmful. From experimental data the conclusion was drawn that if used as a preservative formic acid may be considered as twice as active physiologically as acetic acid.

The rational feeding of the aged, L. Landouzy (*Presse Méd. [Paris], 1907, No. 5, pp. 33–35*).—A French law, enacted in 1905, provides for the assistance of septuagenarians and the author discusses the subject of the preparation of a rational and adequate diet under the provisions of the law. According to his estimates, a man 70 years old and weighing from 60 to 70 kg. requires per day about 47 gm. protein, 53 gm. fat, 259 gm. carbohydrates, and 20 gm. of alcohol, supplied in a quarter of a liter of wine, the total fuel value of the diet being about 1,950 calories. In order that the menus may be readily varied and remain equivalent in nutritive value, data are given regarding the quantities of different food materials calculated to be equivalent in nutritive value.

Some common errors in the diet and general hygiene of children, A. F. Voelcker (*Brit. Med. Jour., 1907, No. 2404, pp. 181–185*).—Diet, feeding, clothing, ventilation, exercise, and similar questions are discussed. The author makes a plea for breast feeding in hospitals, when possible, as opposed to artificial feeding.

Improper feeding of Cardiff children (*Brit. Med. Jour., 1907, No. 2404, pp. 226, 227*).—A summary of a paper by Walford in which the conclusion is reached that pupils in the elementary schools in Cardiff, Wales, suffer from improper rather than insufficient food. The importance of a controlled milk supply and other hygienic features are discussed with reference to the feeding of school children.

Experiments on nutrition: balance of income and outgo of nitrogen and sodium chlorid, M. LETULLE and MLLE. M. POMPILIAN (*Compt. Rend. Acad. Sci. [Paris], 143 (1906), No. 26, pp. 1188–1191, figs. 4*).—Brief statements are made regarding the experiments on the income and outgo of nitrogen and sodium chlorid made with the respiration calorimeter previously described (E. S. R., 18, p. 962). In general, the quantities of both substances eliminated were found to vary with the individual characteristics of the subject, but equilibrium was possible under proper conditions. During fasting the excretion of nitrogen diminishes. When food is taken after fasting the tissues undergo repair. Nitrogen and chlorin equilibrium are reached after oscillations in the excretion.

The influence of flesh eating on endurance, I. FISHER (*Separate from Yale Med. Jour., 1907, Mar., pp. 16*).—Endurance tests were made with flesh eaters and flesh abstainers, which, in the absence of more satisfactory mechanical methods of measurement, included holding the arms horizontally as long as possible, deep knee bending, and leg raising by the subject lying on his back. The results reported, according to the author, "would indicate that the users of low-proteid and the nonflesh dietaries have far greater endurance than those who are accustomed to the ordinary American diet."

"Of the three groups compared, the large flesh eaters showed far less endurance than the abstainers, even when the latter were leading a sedentary life. . . . It is possible that the superiority of the abstainers is due to the absence of flesh foods or to the use of a similar amount of proteid, or to both as well as to the abstention from tea, coffee, and condiments."

With 14 flesh abstainers the average daily nitrogen excretion ranged from 0.095 to 0.15 gm. per kilogram body weight.

The factors of safety in animal structure and animal economy, S. J. MELTZER (*Jour. Amer. Med. Assoc., 48 (1907), No. 8, pp. 655–664; Science, n. ser., 25 (1907), No. 639, pp. 481–498*).—Engines, bridges, etc., are ordinarily constructed so that they possess a strength or capacity in excess of the usual or average demands made upon them, and the author has summarized and discussed a large amount of physiological and other data to determine whether similarly the human body possesses factors of safety, the question as a whole being considered especially in its relation to food requirements and the possible effect of an excess of proteid foods. With the possible exception of the reproductive organs and nerve ganglia, the author concludes that the body is well provided with factors of safety.

"All organs of the body are built on the plan of superabundance of structures and energy. Of the supplies of energy to the animal we see that oxygen is luxuriously supplied. The supply of carbohydrates and fats is apparently large enough even to keep up a steady luxurious surplus. For the supply of proteid we find in the actual conditions of life that man and beast, if they can afford, provide themselves with quantities which physiological chemists call liberal. This may or may not be the quantity which nature requires and approves of. Experiments have shown that a number of men subsisted on the half of such quantities. This latter might be an indispensable minimum, just as there is an indispensable minimum for all other luxuriously endowed provisions of the animal organism, and the liberal ingestion of proteid might be another instance of the principle of abundance ruling the structures and energies of the animal body. There is, however, a theory that in just this single instance the minimum is meant by nature to be also the optimum. But it is a theory for the support of which there is not a single fact. On the contrary, some facts seem to indicate that nature meant differently. Such facts are, for instance, the abundance of proteolytic enzyms in the digestive canal and the great capacity of the canal for absorption of proteids. Such luxurious provision for digestion and absorption of proteids is fair evidence that nature expects the organism to make liberal use of them. Then there is a fact that proteid material is stored away for use in emergencies, just as carbohydrates and fats are stored away. . . . The storing away of proteid, like the storing away of glycogen and fat, for use in expected and unexpected exceptional conditions, is exactly like the superabundance of tissue in an organ of an animal, or like an extra beam in the support of a building or a bridge—a factor of safety."

The author believes, therefore, that "with regard to the function of supply of tissue and energy by means of proteid food nature meant it should be governed by the same principle of affluence which governs the entire construction of the animal for the safety of its life and the perpetuation of its species."

Concerning the extractives of muscle. VI, The identity of ignotin and carnosin, W. Gulewitsch (*Ztschr. Physiol. Chem., 50 (1906), No. 2–3, pp. 204–208*).—The investigations reported showed the identity of ignotin and carnosin, and according to the author the name of "ignotin" should be dropped.

Protein metabolism when carbohydrates are taken, J. E. Johansson and W. Hellgren (*Upsala Läkarefor. Forhandl., n. ser., 11 (1906), Sup. VII, pp. 9*).—Experiments with a man who was engaged in light muscular work showed that neither carbohydrates nor fat, when added to the diet, diminished the excretion of nitrogen. On the other hand, if the protein consumption was increased an increase in nitrogen was noted in 2 hours.

On the excretion of nitrogen, creatinin, and uric acid in fever, J. B. Leathes (*Jour. Physiol., 35, 1907*). *No. 3, pp. 205–214, figs. 2*).—In the experiments reported, the increased nitrogen metabolism which was observed accompanying fever, "was found to involve an increased output of both creatinin and uric acid, as well as of total nitrogen. But the increased output was most marked in the case of uric acid and least marked in the case of creatinin."

On the elimination of sulphocyanates from the blood, and their supposed formation in the salivary glands, D. H. de Souza (*Jour. Physiol., 35 (1907), No. 4, pp. 332–345*).—According to the author's investigations, "sulphocyanates in the food are readily absorbed and remain as such in the body for a considerable time. . . .

"In only one doubtful case [of the experiments reported], then, was there anything to show that sulphocyanates are formed in the salivary glands. In fact the evidence leads one to conclude that this substance is not a specific secretion of the salivary glands, but merely a waste product in the blood which is turned out by the salivary and other glands, together with and in a proportional concentration to the other salts of the secretions."

Draft of a model State pure food and drug law, M. N. Kline (*Amer. Jour. Pharm., 79 (1907), No. 2, pp. 74–78*).—This draft of a pure food and drug law was suggested by the chairman of the committee on legislation of the National Wholesale Druggists' Association.

Food inspection decisions, H. W. Wiley, F. L. Dunlap, and G. P. McCabe (*U. S. Dept. Agr., Food Insp. Decisions 69, pp. 3; 70–72, pp. 4; 73, pp. 2*).—The topics covered by these decisions are the inspection of food and drugs and the identification of inspectors, the abuse of the guaranty for advertising purposes, the labeling of succotash, the use of guaranties and serial numbers thereof, and the interstate transportation of imported meats and meat food products.

According to the decision rendered as to succotash, this word, if used without qualification, is understood to imply that the product designated is composed of green sweet corn and green beans. If soaked beans or soaked corn are used the fact must be declared in the proper manner.

ANIMAL PRODUCTION.

Protein in vetch hay, A. L. Knisely (*Oregon Sta. Rpt. 1905, pp. 59–65*).—Continuing earlier work (E. S. R., 16, p. 801), the protein content of vetch was studied, the work extending over 3 years. Samples were cut at the proper stage for hay making, cured, and analyzed. The average results are summarized in the table which follows:

Protein content of vetch hay, water-free material.

Year	Number of analyses	Maximum protein found.	Minimum protein found.	Average protein found.
		Per cent.	*Per cent.*	*Per cent.*
Sample taken 1903	10	21.31	11.63	17.39
Sample taken 1904	80	23.31	12.19	18.03
Sample taken 1905	152	25.52	9.65	18.85

These results show that there has been, thus far, a steady increase in the percentage of protein in the vetch hay. Two or 3 samples of this year's crop ran extremely low in protein, while many samples contained over 20 and a few, more than 25 per cent protein. All determinations were made either in duplicate or triplicate, corrections being made according to blank determinations.

Early work of the station on the digestibility of vetch hay is cited (E. S. R., 17, p. 65).

Relative values of feeding stuffs, H. P. Armsby (*Pennsylvania Sta. Bul. 71, rev. ed., pp. 16*).—The results reported for clover hay in the first edition of the bulletin (E. S. R., 17, p. 380) were suspected of being too low, a suspicion which later experiments confirmed. This revision contains the corrected results.

Prickly pear and other cacti as food for stock, II, D. Griffiths and R. F. Hare (*New Mexico Sta. Bul. 60, pp. 135, pls. 7, figs. 2, folding tables 7*).—This bulletin reports 187 proximate analyses and 26 ash analyses of samples of different sorts of cacti collected from central Texas to California and southward to the central plateau of Mexico.

In general the analyses show that the cacti may be said to compare favorably with ordinary green fodders and root crops. The apparently high protein and fat content in the fruit of some species is due, as the authors point out, to the large proportion of these nutrients found in the seed. As the seeds are surrounded by a dense layer of indigestible tissue, the high values for protein and fat are misleading. "The analyses show that the fodder value of the fruit of cholla (*Opuntia fulgida*) and related species investigated is little more than that of the stems."

"There are many points of special interest in connection with the ash analyses, especially the high content of potash, magnesium, and calcium. Although the cane cacti show a relatively higher food value, practical considerations relating to growth and ease of propagation render them of less value than the prickly pear, except in certain limited localities where they are especially abundant."

The bulletin contains a brief summary of literature regarding the feeding value of cacti and a general discussion of the importance of these plants as feeding stuffs in arid regions.

Concentrated feeding stuffs, J. P. Street, J. W. Kellogg, and V. J. Carberry (*New Jersey Stas. Bul. 201, pp. 46*).—Under the State feeding-stuff law 471 samples were analyzed, of which 304 belonged to the class that required a guarantee.

The goods analyzed included cotton-seed meal, linseed meal, gluten meal and feed, corn bran and similar goods, hominy meal and feed, distillers' grains, malt sprouts, dried brewers' grains, molasses feeds, proprietary mixed feeds, alfalfa meal, barley feed, curled cocoanut fiber, dried beet pulp, beef biscuit, proprietary poultry feeds, meat meal, beef scraps and similar goods, wheat bran, feeding flour, wheat middlings, wheat feed, ground wheat, wheat and rye bran, rye bran, rye feed, rye middlings, ground rye, corn meal, corn and cob meal, ground oats, ground corn and oats, ground mixed grains, buckwheat middlings, buckwheat bran, and buckwheat feed.

"Of the 160 different brands of feed received, and which should have been guaranteed, 2 failed to meet this requirement.

"Of the 304 samples which were guaranteed, 77 were deficient, 53 of these being low in protein.

"Of the 167 samples which did not require a guarantee, all were pure products, but the wheat brans and feeding flours were below normal quality; one sample each of wheat middlings, rye middlings and rye bran were misbranded.

"No direct adulteration is reported, but the inferiority of cotton-seed meal this year, and the poor quality of certain molasses grains and alfalfa meals, are worthy of notice.

"Certain feeds of good quality still bear guarantees higher than their composition warrants.

"The variability in composition of certain high-grade feeds and the absence of a corresponding variation in selling price demands that a strict regard must be given to the prices asked, as well as to the amount of nutrients guaranteed.

"The cheapest protein feeds this year were buckwheat middlings, malt sprouts, dried brewers' grains, high-grade distillers' grains, and cotton-seed meal."

Analyses of feeding stuffs and mineral and spring waters, A. L. Knisely (*Oregon Sta. Rpt. 1905, pp. 69–72*).—Analyses are reported of western wild oats (*Avena fatua*) at different stages of growth, alfalfa, blue clover (*Melilotus cœrulea*), mill feed, oat chop, dairy chop, gluten feed, wheat bran, prepared cattle food, and several varieties of barley. A number of mineral and spring waters were also analyzed. The percentage composition of wild oats in proper condition for hay making was water 61.11, protein 2.72, fat (ether extract) 1.58, nitrogen-free extract 22.61, crude fiber 9.20, and ash 2.78 per cent. The percentage composition of blue clover was water 11.63, protein 19.17, fat 2.07, nitrogen-free extract 36.71, crude fiber 22.44, and ash 7.98 per cent.

Judged by the analytical data, "wild oats are considerably richer than average timothy hay, nearly as rich as Kentucky blue grass or redtop, and compare favorably with orchard grass and ordinary oat hay. . . . The so-called blue clover is a plant exceedingly rich in protein."

Grape marc and its utilization for feeding farm animals, E. Bertainchand (*Bul. Dir. Agr. et Com. [Tunis], 10 (1906), No. 4, pp. 527–529*).—Analyses are reported of different sorts of grape marc and its value as a feeding stuff is favorably spoken of.

Utilization of grape by-products: Dried grape marc, L. Roos (*Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), No. 7, pp. 197–200*).—A summary of data on the feeding value of grape marc. Analytical and other data are quoted.

Tests of the relative feeding value of dried beet chips, "sugar chips," and dried beet leaves carried on with steers and sheep, W. Schneidewind (*Landw. Wchnschr. Sachsen., 8 (1906), No. 51, pp. 406–410*).—The data summarized regarding the feeding value of dried beet chips, dried "sugar chips," and dried beet tops in tests with steers and sheep indicate that the dried beet forage is the least economical and the "sugar chips" the most economical of these feeding stuffs.

The digestibility of rice feed meal rich in fat, O. Kellner and L. Lepoutre (*Landw. Vers. Stat., 65 (1907), No. 5–6, pp. 463–465*).—In experiments with sheep it was found that rice meal rich in fat had the following coefficients of digestibility: Dry matter 70.2, protein 64.4, fat 82.9, nitrogen-free extract 81.8, and crude fiber 24 per cent.

Additional information concerning the feeding stuff control law, A. Goss and W. J. Jones, Jr. (*Indiana Sta. Circ. 7, pp. 14.*)—This circular, which supplements a previous publication (E. S. R., 18, p. 1073), gives information of interest especially to manufacturers and dealers regarding the proper way to make a declaration respecting a feed, the use of labels and tags, and similar matters.

Stock feeding, J. Michels (*South Carolina Sta. Bul. 128, pp. 24, fig. 1*).—A general discussion of the principles and practice of the feeding of dairy cattle, pig feeding, and silos and silage with special reference to local conditions.

Experiments in animal nutrition, W. P. Gamble (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 74–87*).—A summary and discussion of animal feeding precedes a report of the results of experiments with sheep and steers on the digestibility of a number of feeding stuffs, particularly of the by-products of flour and cereal meals. The average results which were obtained follow:

Average digestibility of a number of feeding stuffs.

Kind of feeding stuff.	Kind of animal.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Oat hulls	Steer	51.39	92.13	83.81	59.10
Oat dust, average 2 trials	Sheep	68.15	79.01	69.51	[a]34.48
Oat dust	Steers	64.90	73.51	61.07	30.14
Corn meal, average 2 trials	Steers	80.63	92.60	88.72	89.26
Corn bran	Steers	52.24	67.17	68.19	25.75
Clover hay	Sheep	70.08	52.32	66.43	31.19
North feed	Steers	73.02	91.23	79.21	72.04
Mill feed	Steers	55.26	66.95	72.28	48.99
Green corn fodder	Steers	68.25	85.31	78.59	87.12
Field cured corn	Steers	35.89	83.85	85.85	71.29
Corn silage	Steers	56.81	61.69	74.88	74.25
Oat straw	Steers	36.81	74.99	70.27	41.73
Mixed chop	Steers	73.27	49.63	69.44	51.04
Brewers' grains	Steers	77.34	95.28	72.88	52.[illegible]
Barley dust, average 2 trials	Steers	60.15	73.36	54.64	3[illegible].24
Ground oats	Steers	66.83	97.20	81.09	[illegible].22
Dried molasses beet pulp	Steers	65.59	9.45	78.56	[illegible]03
Wheat bran	Steers	75.18	66.47	74.[illegible]	[illegible]
Pea bran, average 2 trials	Sheep	66.15	80.89	77.[illegible]	[illegible]

[a] One test only.

The feeding value of beet pulp is discussed at length and data from a variety of sources summarized. Analyses of fermented and unfermented beet pulp and the whole beet are reported, as well as analyses of a number of commercial feeding stuffs, including among other materials ground barley, wild oats, crushed peas, pea meal, malt combings, ground screenings, and mixed feeds. The need of a Canadian feeding-stuff law is pointed out.

Fattening steers for export, G. E. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 158–163*).—Two lots of 11 steers each and one lot of 7 steers were used to test the relative merits of long and short feeding periods. The ration in every case consisted of mixed grain with hay, silage, and roots.

On a heavy grain ration, on an average 0.607 lb. per 100 lbs. of live weight per day, the average daily gain per head in the short period, 60 days, was 1.61 lbs. and the cost of a pound of gain 9.59 cts. On a light grain ration, 0.566 lb. per 100 lbs. of live weight per day, the average daily gain was 1.5 lbs. per head and the cost of a pound of gain 9.09 cts. In the long period, 153 days, the average daily gain was 1.62 lbs. per head, the cost of a pound of gain 8.47 cts., and the average grain consumption 0.489 lb. per 100 lbs. of live weight per day. The steers fed for the longer time were at the beginning of the test on an average 200 to 400 lbs. lighter than the others.

The following deductions were drawn from the test, although the results are not regarded as final: "To feed steers cheaply, the meal ration should be kept as low as possible consistent with securing a reasonable gain in weight. Heavy, fleshy (short keep) steers may be fed a heavier meal ration per 100 lbs. live weight than lighter and thinner steers, and give an equal profit, making allowance for their greater first cost per pound. The lighter and thinner the steers, the greater the need for economizing in regard to the meal ration. Condition being equal, heavy steers are worth more per pound to buy as feeders than lighter ones, the selling price per pound being the same. Weight being equal, a fleshy steer is worth more per pound to buy as a feeder, the selling price per pound being the same. The lighter and thinner the steer the greater the 'spread' between the buying and selling price per pound necessary to compensate the man who feeds him."

The relative merits of feeding steers loose and tied in stalls were tested with the 2 lots which were fed for the short period. The 11 steers fed the light ration were tied and 4 of the steers which were fed the heavy ration were allowed to run loose. In the case of the latter animals the average daily gain was 2.31 lbs. per steer and the cost of a pound of gain 6.34 cts. "It will be noticed that the loose steers made a much greater gain than those kept tied and at a much smaller cost per pound. . . . No doubt much of this advantage was due to the fact that the loose steers suffered no setback from scouring." The author points out that the difference in favor of the profit with the loose steers would have been still greater if they had been of the same weight as the animals fed tied instead of being lighter.

Feeding tests, F. W. TAYLOR (*New Hampshire Sta. Bul. 129, pp. 255–257*).—In a 60-day test, the relative value of protena was studied in comparison with a mixture of equal parts of bran, corn meal, cottonseed meal, linseed meal, and [illegible] Grains. Two Jersey cows in approximately the same period of lactation [illegible]ed 8 lbs. per head per day of the grain rations, together with mixed hay [illegible]. On the protena ration, the total milk production was 1,048.2 qts., [illegible] to 146.36 lbs. of butter, and on the mixed ration, 1,211 qts., equivalent [illegible]4 lbs. of butter.

[illegible]st per quart of milk produced was 1.19 cents for the protena and 1.10 [illegible] the mixed ration. The protena, which is made up largely of ground [illegible] more or less dusty and forms a sticky paste in the mouth, and for that [illegible]s not eaten with the same relish as the variety ration."

[illegible]eding value of protena was further tested with 5 pigs. On this material [illegible] milk there was a total gain of 151 lbs. in 30 days, at a cost of 3.27

cents per pound. "The bulky nature of the protena had a distending effect on the pigs' stomachs and induced a rapid and healthy growth."

A test was also made to determine to what extent silage can replace grain in the winter feeding of dairy cows, but final conclusions were not drawn. "It has already been found, however, that the flow of milk is lessened as the amount of grain is reduced and is not fully restored as the amount of silage is increased. The exact data regarding cost of rations, quality of milk, and condition and healthfulness of the animals are not ready for publication."

Brief statements are made regarding the station poultry plant and sheep breeding tests which it is planned to undertake.

The feeding value of spelt [emmer] in beef and pork production, J. W. Wilson and H. G. Skinner (*South Dakota Sta. Bul. 100, pp. 119–128, fig. 1*).—Three lots of 4 steers each and 1 lot of 3 steers were used in a test covering 170 days, undertaken to compare shelled corn, whole and ground emmer, or, as it is called here, spelt, and shelled corn and spelt 1 : 1, prairie hay being fed in addition to the grain in every case. The average daily gain per head ranged from 1.54 lbs. on the ground spelt to 2.38 lbs. on shelled corn. The shelled-corn lot required the smallest amount of grain per pound of gain, 8.48 lbs., and made gains at the least cost, 7.4 cts. per pound. The largest amount of grain per pound of gain, 10.60 lbs., was noted with the lot fed whole spelt. Gain was most expensive on ground spelt, costing 9.3 cts. per pound.

"This test shows that a pound of corn is equal to 1.25 lbs. of spelt for steer feeding. It also shows that where the corn and spelt were mixed half and half by weight the relation is about the same, with a small increase in gain in favor of the mixture."

From data obtained in earlier experiments with corn and the results noted in a 44-day supplementary period with pigs on whole and ground spelt, and on spelt and corn the authors estimated the total gains made by the 2 lots of 2 pigs while following each lot of steers. These values ranged from 56 lbs. in the case of ground spelt to 188 lbs. in the case of corn. The smallest amount of extra grain, 129 lbs., was fed to the last-mentioned lot and the largest quantity, 941 lbs., to the first-mentioned lot. "These results show that there is very little feed for swine when following steers fed on ground spelt."

Spelt with the husks and the husks alone were analyzed. The authors call attention to the fact that the husk contains the greater part of the crude fiber and that when ground the grain separates from the husk.

The fattening of calves for veal, J. Porter (*Jour. Bd. Agr.* [*London*], *13* (*1907*), *No. 12, pp. 727–731*).—On the basis of personal experience, the various questions connected with the profitable fattening of calves on whole milk are considered. In an instance cited, a calf fed whole milk for 4 weeks made a total gain of 70 lbs. A calf thus fed should, according to the author, receive not over 16 lbs. of milk per day at the end of the first week and this should be increased to not over 30 lbs. per day at the end of the fourth week of feeding.

"Probably a month is as long as it is advisable to feed calves on whole milk on a dairy farm, or until they have reached about 160 lbs. live weight or 96 lbs. of veal. This weight may be attained in a month, provided the calves are fatted as quickly as possible; but one can not expect to do it unless the calves are fed three times a day. An effort should also be made to have the calves fat at the time veal commands a high price; otherwise the returns from vealing calves on whole milk may not be at all satisfactory."

Cost of wintering yearlings, F. W. Taylor (*New Hampshire Sta. Bul. 129, p. 248*).—The cost of wintering for 5.5 months 4 lots of 2 heifers each on a ration of bran and corn-meal alone and supplemented by linseed meal, gluten feed, and cotton-seed meal, ranged from $19.28 on the linseed-meal ration to

$20.95 on the cotton-seed meal ration. The heifers fed the linseed-meal ration were in better condition than the others.

[Pig feeding], G. E. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 151–158*).—From records which have been kept at the station with a considerable number of pigs, the author calculates that the cost of feed from birth to weaning is $3.91 per litter, the average live weight when marketed 176 lbs. per pig, the cost of feed per pound of live weight from birth to market condition 4.2 cts., and the average total cost per pound, including service fee and maintenance of dry sow, 4.61 cts.

The data gathered at the station were supplemented by the results of coöperative investigations carried on by 10 farmers according to instructions. As shown by the data for 95 pigs, the average age of weaning was 52 days, the average age at which pigs were marketed 214 days, and the average live weight when marketed 200 lbs.

The cost of raising pork is calculated on the basis of meal at different values, ranging from $20 to $23 per ton. At the higher value and estimating that the pigs cost $1.50 each at weaning time the average cost of a pound was 4.49 cts., and estimating that the pigs cost $2.50 each at weaning time it was 4.99 cts.

"That the average cost per pound should be within 5 cts., when meal is valued at $23 per ton, and the pigs at $2.50 each when weaned, is much beyond our expectations.

"We regard $20 per ton a fair valuation of meal when the grain is home grown, as it includes much that is not marketable. Even when much of the feed has to be bought, we believe that, with a little foresight, the meal bill can be kept well under $22 per ton. If the farmer buys injudiciously, or uses unnecessarily high-priced foods, he should not blame the pigs.

"These experiments show cheaper average gains than were obtained in our own work, but most of these experiments represent summer feeding, whereas most of our feeding was done during the winter."

Relative value of shelled corn and corn meal for fattening pigs, W. A. Henry and D. H. Otis (*Wisconsin Sta. Bul. 145, pp. 16, fig. 1*).—Noted from another publication (E. S. R., 18, p. 1074).

Experiments on the utilization of betain by ruminants (sheep), W. Völtz (*Arch. Physiol. [Pflüger], 116 (1907), No. 5–6, pp. 307–333*).—From the investigations reported the conclusion was drawn that there is not the slightest reason to consider betain a nitrogenous nutrient. On the other hand, it is very probable that it causes harm when taken in large doses even in a very soluble form.

Light and heavy oats for horses, F. W. Taylor (*New Hampshire Sta. Bul. 129, pp. 248–251*).—The comparative value of light and heavy oats was studied with 3 pairs of work horses of Percheron blood, 1 animal in each lot being fed heavy oats for 30 days and the others the light oats. During an additional period of 30 days the conditions were reversed. In all cases 16 lbs. of oats were fed each day with mixed hay of average quality ad libitum. All the horses performed farm labor requiring average exertion and endurance.

As shown by weighings taken twice a week, 1 horse lost on both light and heavy oats, 5 gained on heavy oats, and 4 gained on light oats. "The total gain or loss in any case was not material and was not much greater than the variation in weight from one day to another. The practical results of this experiment seem to indicate that, pound for pound, the light oats have nearly the same feeding value as the heavy oats. Although the heavy oats contain a higher percentage of protein, fat, and nitrogen-free extract, and a less percentage of fiber than the light oats, it seems probable that the relative proportions of these constituents in the two grades are such that they are more easily and thorougly digested. . . . The percentage of kernel, as would be expected, bears a close relation to the weight per bushel. It should be remembered that although the two grades are practically equal, pound for pound, they are not equal, quart for quart, and that in feeding by measure, as is usually done, due allowance should be made for the heavy oats and a less quantity given. Since oats are bought and sold by weight instead of measure there seems to be no gain made in buying the heavy oats at a much advanced price over the light oats." The oats used were analyzed.

Mule raising at Poitou, H. Raquet (*Ann. Gembloux, 17* (*1907*), *No. 1, pp. 19–32, figs. 4*).—The care and management of asses, breeding of mules, and related questions are considered.

Poultry management, G. A. Bell (*U. S. Dept. Agr., Farmers' Bul. 287, pp. 48, figs. 14*).—This bulletin is condensed from an article on general poultry management previously noted (E. S. R., 18, p. 1158) and deals exclusively with the chicken industry.

[Poultry], W. R. Graham (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32* (*1906*), *pp. 201–210, fig. 1*).—Data regarding the class-room work in poultry, new poultry buildings, and the general plan of poultry feeding followed at the station are given, as well as the results of a number of tests.

In a study of egg evaporation in relation to incubation it was found that the average evaporation of eggs hatched by hens in nests out of doors was 10.9 per cent, of eggs hatched in nests on moist earth and kept indoors 11.9 per cent, in nests containing chaff and kept indoors 15.15 per cent, and in an indoor nest lined with rubber cloth 10.9 per cent. Eighty-seven per cent of the fertile eggs hatched in the out-of-door nests on an average, while with the indoor nests the range was from 77 per cent in the chaff nests to 100 per cent in the nests lined with rubber cloth.

With eggs hatched in incubators the evaporation of hatched eggs ranged from 9.1 to 16.3 per cent of their original weight and the percentage of fertile eggs which hatched in the different incubators from 64.9 to 76.3. Considering both natural and artificial methods the evaporation of individual eggs which hatched ranged from 5.9 to 27 per cent.

Data are also reported regarding the evaporation and the number of chickens which hatched in the case of eggs laid by the same hen. In the author's opinion it is preferable in artificial incubation to keep the evaporation of the eggs about the same as that noted with hens out of doors on the ground. "It appears to me that this is nearer nature, and the chicks so hatched did well in the majority of hatches. There was a large per cent of carbonic-acid gas under the hens in the air around the eggs. The temperature of the air was about 101° F., and the relative humidity was somewhat less than the air in the room."

When late-hatched chicks were fed from a hopper wheat with some cracked corn and a little other feed also and kept in a cornfield where they were allowed to run loose after the first day, very satisfactory gains in weight were noted. "The corn field was considerable distance from the plant and no water was near by; hence we made no pretense to water the chicks." The author states that he would not at present advocate not watering chicks, but mentions this fact in connection with the conditions under which the chicks were raised. When 26 days old such chicks averaged 8.5 oz. in weight, while those in the poultry run averaged 3.25 oz. When 8 weeks old the average weights were 2 lbs. and 10.6 oz., respectively, and when 4 months old cockerels raised in the cornfield weighed 5 lbs. each.

In the author's opinion, a cultivated hoe crop and hopper feeding are worthy of serious consideration when one wishes to grow the best chickens with the least trouble. "One hen laid in 20 days after being put out with chicks. Nearly all the hens laid in reasonable time and their plumage was glossy."

The value of different feed mixtures, some of which contained molasses, was tested in a 2 weeks' period with 9 lots of 12 birds each. The greatest gain, 15.5 lbs. per lot, was noted on a ration of shredded wheat and corn meal 1:1 mixed with molasses and sour milk, and the smallest gain, 6 lbs. per lot, on bread and sour milk. With this lot the cost of a pound of gain was 9.58 cts., the highest value noted, while with the first mentioned lot it was 5.04 cts., the lowest value noted.

When different rations for fleshing chickens were tested with 5 lots of 12 birds each for a week, the greatest gain, 9 lbs. per lot, was found with the chickens fed shredded wheat, corn meal, and oatmeal 1:1:1 with sour milk, and the gain was also most cheaply made with this lot, costing 3.38 cts. per pound. The smallest gain, 6.5 lbs. per lot, was noted with the lot fed shredded wheat mixed with whey. The gain was most expensive with the lot fed shredded wheat and corn meal 1:1 with molasses and sour milk, costing 5.98 cts. per pound.

"It will be noticed that a mixture of grain gave better results than any single food. We have had similar results in previous years, and generally speaking I would recommend a mixed ration in preference to one composed of any single grain.

"Molasses has not so far proved to be an economical food as to cost or number of pounds of gain produced. It also appeared to induce feather pulling.

"Whey did not give as good results as milk, yet is a food worth considering. This year's tests and last year's tests [E. S. R., 17, p. 177] both indicate that whey has considerable value.

"Shredded wheat made a better showing than either bread or ground wheat. The chickens fed on bread soon tire of the ration and in one instance developed indigestion. Ground wheat was relished better for the entire period of feeding than was shredded wheat, but did not make as economical gains."

Several rations were tested in which weed seeds formed half or all of the grain ration. The birds absolutely refused to eat these rations with the exception of one which was made up of refuse shredded wheat biscuit and weed seeds 1:1 mixed with milk.

To determine whether weed seeds could be used as a feeding stuff despite the fact that the hens did not like them, a test was made in which such seeds mixed with water were fed with a cramming machine. The recorded data show that the chickens lost weight.

"The results were that the birds appeared to be unable to digest the food. Apparently there are some seeds which are indigestible, so far as chickens are concerned. If the crops were moderately well filled it would take almost 36 hours to empty them; so that we found to feed them twice a day we could give but very small quantities. The food did not seem to satisfy the birds at all; or, in other words, when they were put back in the coops they would whine and be constantly looking for something to eat. They acted as if they were starving to death. In fact, after feeding 1 week we found it necessary, in order to save the birds' lives, to change the method of feeding entirely."

Some data are also recorded regarding the gains made after the weed seed period and also by birds fed shredded wheat and weed seeds.

In a test of the gains made by ducks of different varieties it was found that in 9 weeks Pekin ducks made an average gain of 4.6 lbs. and Cayugas 4.17 lbs., and in 8 weeks Indian Runners 3.21 lbs. per head. The grain required per pound of gain in the 3 cases was 2.6, 3.12, and 3 lbs., respectively. All the lots were fed alike "a mash composed of 4 parts corn meal, 3 parts oatmeal, 1 part shorts, to which was added 25 per cent meat meal. The mash was mixed with cold water. Sprouted wheat and bread and milk were fed once daily, being last fed at night. The ducks were fed 4 times daily until 6 weeks of age, then 3 times daily."

Brief statements are also made regarding the domestic and wild geese raised at the station.

Alfalfa for chickens and ducks, W. M. SAWYER (*Breeder's Gaz., 51 (1907), No. 15, p. 848, figs. 2*).—On the basis of personal experience the author recommends alfalfa for chicken and duck feeding, and briefly discusses the care and management of ducks and related questions.

"Always catch ducks by the neck to lift them around, and carry them by catching hold of the butts of their wings or by holding them around the body. If caught by the legs they are easily sprained and sometimes broken."

Locusts for fowls (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 1, p. 8*).—A brief note in which the value of dried locusts for poultry is spoken of on the basis of personal experience. A liberal supply, it is said, can be fed to young ducks and chickens with advantage.

Turtle raising in Japan (*Trans-Pacific Trade, 1 (1907), No. 1, p. 6*).—The raising of turtles for food under artificial conditions in Japan is described.

DAIRY FARMING—DAIRYING.

Report of the professor of dairy husbandry, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 90–132, figs. 2*).—Results of experiments in butter making, cheese making, determining moisture in dairy products, and milk testing, as well as work along other dairy lines, are presented in this report. Many of the experiments are in continuation of previous work (E. S. R., 17, p. 903).

Experiments in butter making (pp. 91–108).—Butter was made from sweet pasteurized cream with and without the addition of a starter and from ripened cream. Incidentally tests were made of several butter preservatives. The butter was made during the months of June, July, and August, and shipped to Montreal, where it was scored and then forwarded to London, where it was again scored.

Some of the conclusions reached are as follows: The sweet cream was churned in less time than the ripened cream. The buttermilk from the sweet cream contained more fat than the buttermilk from the ripened cream. The moisture content of the butter was fairly constant, averaging 13.79 per cent. Unsalted butter received the highest scores both in Montreal and London. There was little or no difference in the quality of the butter made from the different lots of cream, neither was the quality affected apparently by the preservative used. Borax gave as good results as any of the preservatives tried. Butter made from gathered cream was as good as that made from cream separated at the factory.

In 63 experiments, tests were made of various methods of churning as regards their effect upon the moisture in butter. It was found that the overrun would vary considerably from day to day when the same method of churning was followed as closely as possible. "However, after summing up the whole question and averaging all the results there would appear to be an increased 'overrun' as a result of massing the butter in the buttermilk, or washing the butter in comparatively warm water with the rollers of the combined churn and worker in motion." The percentages of moisture, curd, and salt did not bear a constant relation to the percentage of overrun. "So far as the quality of the butter is indicated by the results in scoring there was not much difference from the various methods followed, showing that a butter maker may vary his methods considerably from what are regarded as standard rules and still be able to make a good quality of butter. However, the tendency was for 'mottled' and 'gritty' butter when the butter was massed in either the buttermilk or the wash water. The tendency was toward 'greasy' butter when it was washed in water at too high a temperature or with the rollers in motion."

Experiments in cheese making (pp. 108–119).—Rennet and pepsin for coagulating milk in cheese making were again compared. "As a result of 3 years' work comparing rennet and pepsin as agents for coagulating milk, we are not prepared to recommend pepsin in preference to rennet, chiefly because the pepsin is more difficult to prepare for addition to the milk, and there appears to be no advantage in yield or quality of cheese as a result of using the pepsin."

Comparative tests were again made of using rennet at the rate of 3⅜ and 6¾ oz. per 1,000 lbs. of milk. As in previous years, the yield of cheese was slightly greater when double the usual quantity of rennet was used. There was little difference in shrinkage or in the quality of the cheese. The extra rennet apparently hastened the ripening process.

The results of experiments in cooking the curd at different temperatures were in favor of a temperature between 98° and 100° F. Only in special cases such as overripe milk is it considered advisable to use a higher temperature.

While the moisture in the curd at the time of dipping averaged 52.49 per cent in one series and 47.81 in another, the difference in the moisture of the green cheese was less than 0.5 per cent. The acidity developed faster in the curd with the excessive moisture and the yield of cheese was slightly higher. The quality of the cheese was apparently unaffected by the amount of the moisture in the curd at the time of dipping.

Further experiments were made in regard to the acidity of the curd at the time of salting. The development of 0.1 per cent more acid before salting decreased slightly the yield of marketable cheese, but tended to improve the quality.

Additional experiments in ripening cheese at different temperatures confirmed previous conclusions that the lower the temperature the less the shrinkage and the better the quality of the cheese. The results indicate that cheese may safely be transferred directly from the press to a room having a temperature of about 40° F.

Another year's work in ripening cheese on shelves as compared with boxing directly from the press confirms the previous conclusion that it is quite practicable to put cheese into a clean dry box and place in cold storage at 40°.

Determining moisture in butter, curd, and cheese (pp. 120–125).—The author outlines methods of determining moisture in dairy products by drying in an oven and also describes a rapid method devised by him for determining moisture in curd at the time of dipping. The method is based upon the assumption that the specific gravity of a given volume of curd varies approximately according to the water content of the curd.

"For obtaining comparatively uniform percentages of moisture in the curds at dipping, we suggest to cheese makers that they try the specific gravity or weight plan. The results of our work seem to indicate that if a given volume of curd weighs slightly less than 1 gm. for each cubic centimeter of curd packed closely into a cylindrical vessel, it will contain about the proper degree of moisture at the time of dipping. The results further show that for each increase or decrease of 0.1 gm. in weight, which 17.5 cc. of curd may vary, the moisture increases or decreases by about 0.6 per cent."

Milk and cream testing (pp. 125–130).—In 18 tests the differences in the reading of the Babcock test of measured and weighed samples of cream varied from 0 to 1.5 per cent.

Comparative tests were made of the Babcock and Gerber methods. The differences with milk testing from 3 to 5 per cent rarely exceeded 0.1 per cent.

Notes are given on the official tests of Holstein cows made during the year.

Dairy herd record (pp. 130–132).—Records are given of the dairy herd of 19 cows for 1 year. The yield of individual cows ranged from 11,499 lbs. of milk to 3,952 lbs., and the profit on milk over cost of feed from $1.39 to $36.99.

Investigations on the influence of food fat upon the milk production of cows, O. KELLNER (*Illus. Landw. Ztg., 27 (1907), Nos. 43, pp. 387, 388; 44, pp. 397–399; Molk. Ztg., 21 (1907), No. 25, pp. 687–690*).—At the instigation of the association of agricultural experiment stations in Germany and under the authority of the German government, 10 agricultural institutions conducted experiments on a uniform plan to determine the influence of rations rich and poor in fat upon the yield and composition of milk. The general results are summarized in these articles.

Five institutions employed the period system and 5 the group system of feeding, both methods giving practically the same results. Twenty cows were used in each experiment. The rations compared contained the same amounts of digestible matter, but one was richer in carbohydrates and the other richer in fat. The digestible fat in the 2 rations was, respectively, 0.4 to 0.5 and 0.9 to 1 kg. per 1,000 kg. live weight.

The principal result of the experiments was to the effect that the substitution of fat for the equivalent amount of carbohydrates was not only of no advantage but as a rule was unfavorable as regards both the yield of milk and fat.

In general the percentage of fat in the milk varied inversely as the yield of milk. The properties of the butter fat were appreciably affected by feeding the ration rich in fat, and it is, therefore, possible that in this way the quality of the butter might at times be improved profitably. Aside from this and some other exceptional uses it is not considered desirable to increase the fat in rations in place of the less expensive carbohydrates.

Investigations on the influence of feeding on the milk secretion of cows, W. VON KNIERIEM and A. BUSCHMANN (*Landw. Jahrb., 36 (1907), No. 2, pp. 185–265*).—In the first of 2 series of experiments made with a herd of 55 cows, the authors studied the influence of feeding cocoanut cake, dried brewers' grains, and wheat bran on the yield and composition of milk and on the composition of the butter fat. In the second series similar studies were made with cocoanut cake, linseed cake, and rape-seed cake.

Feeding large quantities of cocoanut cake appeared to increase the fat content of the milk, while brewers' grains apparently reduced the fat content as compared with wheat bran. The constants of the butter fat were materially affected by the character of the rations fed.

In the second series of experiments the milk of 3 cows fed cocoanut cake showed a progressive increase in the percentage of total solids and fat. Linseed cake and rape-seed cake did not give as satisfactory results. Variations in proteids and fat-free solids were small in all instances. The butter fat showed considerable variations in the saponification and iodin numbers. The melting point remained constant.

Aseptic milking, V. WILLEM (*Bul. Agr. [Brussels], 23 (1907), No. 5, pp. 350–375*).—The author discusses quite fully various efforts which have been made to prevent or lessen the usual bacterial contamination of milk during the process of milking, referring particularly to the experiments of Backhaus, von Freudenreich, von Behring, and to those conducted by himself in collaboration with Miele (E. S. R., 17, p. 179).

Milk drawn by the author's method contained on an average 102 bacteria per cubic centimeter after being kept at low temperatures for 39 hours. The milk remained sweet for 10 to 20 days at temperatures of 13 to 15° C. The author also examined 29 samples of mixed milk from 4 or 5 cows, the milk being obtained during August and September under strict aseptic precautions and kept at a temperature of 20 to 24°. At the time of milking the number of bacteria per cubic centimeter varied from 11 to 55 and after 24 hours from 7 to 128. The milk remained sweet for 8 to 30 days.

The results of observations made by the author in dairies in Germany and Switzerland relating to cleanliness in milking are incorporated in the article.

Official tests of dairy cows, 1905-6, F. W. WOLL and R. T. HARRIS (*Wisconsin Sta. Bul. 144, pp. 65, figs. 20*).—During the year the station conducted 922 tests of cows, the results of which are reported in full in this bulletin. The number of cows tested was 315, of which the Holsteins numbered 219, the Guernseys 76, the Jerseys 15, and grades 5.

The station has arranged for a system of semiofficial yearly records to be secured by testing each cow for 2 successive days each month during the year. Results of a considerable number of such tests are reported. Photographs of some of the best cows tested during the year are reproduced in the bulletin and the rules governing the dairy tests are appended.

Bitter milk, TRILLAT and SAUTON (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 17, pp. 926-929*).—According to the experimental results reported by the authors, bitter milk may be produced by yeasts and bacteria capable of forming simultaneously both aldehydes and ammonia. Several yeasts isolated from cheese when inoculated with an ammonia-forming bacillus, produced in milk about 0.4 per cent of aldehydes and 0.2 per cent of ammonia, making the milk very bitter.

Butter fat in milk, T. FARRINGTON (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 5, pp. 263-267*).—The author calls attention to an inverse relation existing between the fat content of milk and the volatile acids in the fat, and gives figures showing a seasonal variation—the minimum fat content and the maximum volatile acids occurring in April and May and the maximum fat content and the minimum volatile acids in November. He thinks that this principle may possibly be utilized in deciding upon the genuineness of samples of milk having low percentages of fat.

A new method for preventing char in the Babcock centrifugal determination of fat in milk and milk products, M. L. HOLM (*Amer. Food Jour., 2 (1907), No. 7, p. 28*).—After the sample is measured or weighed into the test bottle the author adds 2 cc. of 80 per cent glycerin and then adds the sulphuric acid and centrifuges in the ordinary manner.

Moisture, salt, and curd in butter, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 72, 73*).—In 162 samples of creamery butter made with a view to incorporating a high amount of moisture, the average, maximum, and minimum percentages of water were, respectively, 14.1, 19.92, and 10.34. In 113 samples entered in a butter contest the average, maximum, and minimum percentages of water were, respectively, 12, 15.82, and 9.04. Salt determined in 168 samples from the two lots varied from 0.61 to 5.98 per cent and averaged 2.33 per cent. The proteids in 167 samples calculated by multiplying the nitrogen by the factor 6.38, varied from 0.102 to 0.840 and averaged 0.564 per cent.

Sweet-cream butter (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 13, pp. 15*).—Part 1 of this bulletin by F. T. Shutt and A. T. Charron gives the results of a study of the so-called sweet-cream process of butter making to which particular attention has been called by J. D. Leclair. In this process the cream is pasteurized immediately after separation, cooled, inoculated heavily with a pure culture starter, and churned at once. Detailed data are given for the 3 comparative trials of the sweet cream and ripened cream methods from which the authors conclude that by the sweet-cream process there is no greater loss of butter fat than in the ordinary method with ripened cream, and that the keeping qualities of the butter by the sweet-cream butter are distinctly superior to those of the ripened cream butter.

Part 2 of the bulletin, by J. G. Bouchard, gives directions for the manufacture of butter from sweet or unripened cream.

Standard butter packages (*Dept. Agr. and Tech. Instr. Ireland Jour., 7 (1907), No. 3, pp. 474–488*).—Experiments were conducted for the purpose of ascertaining if boxes of different capacities are required for the same quantity of butter packed during the winter and summer months and for salted and unsalted butters.

From the results obtained it is recommended that boxes should have uniformly a capacity of 1,722 cu. in. and kiels 3,450.5 cu. in. The internal dimensions approved for a box for 56½ lbs. of butter are as follows: Bottom 11 in. square, top. 12 in. square, depth 13 in. The dimensions approved for kiels for 113 lbs. of butter are as follows: Diameter at top and bottom 13⅝ in., diameter at bulge 15¾ in., and depth 19⅝ in.

Coating the interior of butter packages with paraffin is recommended.

Contribution to the knowledge of the action of rennet upon casein, M. VAN HERWERDEN (*Ztschr. Physiol. Chem., 52 (1907), No. 1–2, pp. 184–206*).—The products formed from casein through the action of rennet are designated by the author, paracasein A, paracasein B, and substance C. When the rennet has acted for only a short time the principal product is the paracasein A. This disappears entirely during the prolonged action of the rennet. Paracasein A and B differ in but few of their properties. The substance designated C is a cleavage product of casein and differs from the paracasein in being precipitated by tannic acid and in not reacting with dilute acetic acid, nitric acid, and several other reagents. The properties of the 3 proteids are discussed and summarized in tabular form.

Influence of lactose and lactic acid on the decomposition of casein by micro-organisms, O. LAXA (*Milchw. Zentbl., 3 (1907), No. 5, pp. 200–207*).—The author has studied the action of several species of bacteria and molds upon pure casein as affected by the presence of milk sugar and lactic acid.

The peptonization of casein by certain organisms was very favorably influenced by the lactose but hindered by the lactic acid. The restraining effect of the lactic acid varied greatly with the different organisms but was on the whole more marked with the bacteria than with molds.

Ripening of Edam cheese, F. W. J. BOECKHOUT and J. J. O. DE VRIES (*Rev. Gén. Lait, 6 (1907), No. 11, pp. 248–254, pl. 1*).—In a number of experiments, cheese made from milk obtained with great care to prevent contamination and inoculated with pure cultures of lactic-acid bacteria and a liquefying diplococcus failed to undergo normal ripening. The authors conclude that the liquefying bacteria, which are common in green cheese but which disappear early, do not play any important rôle in the ripening process either directly or by means of enzyms produced by them. They were, moreover, unable to isolate from cheese enzyms capable of liquefying gelatin.

Investigations in the manufacture and curing of cheese. VII, Directions for making the Camembert type of cheese, T. W. Issajeff (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 98, pp. 21, figs. 10*).—This has already been noted from another source (E. S. R., 18, p. 1079).

VETERINARY MEDICINE.

The effect of sunlight upon pathogenic bacteria, R. Wiesner (*Arch. Hyg., 61 (1907), No. 1, pp. 1–102, figs. 16*).—This article is a report upon one of a most elaborate series of investigations regarding the effect of sunlight in attenuating or otherwise influencing pathogenic bacteria. The organisms used in these experiments included *Staphylococcus pyogenes aureus*, the bacilli of diphtheria and typhoid fever, and pathogenic bacteria.

It appears that the number of bacteria in any given mass exposed to the sunlight has no effect upon the length of time during which they live. Differences in resisting power, however, are observed among the different bacteria in a mass of infectious material. From the author's experiments it would appear that the resisting power of pathogenic bacteria toward sunlight increases with the age of the bacteria.

Pathogenic micro-organisms show a greater resisting power toward sunlight in the presence of abundant nutriment than when the nutriment is withheld. All of the rays of the spectrum, including the visible and invisible rays, exercise a bactericidal influence, but the maximum effect is shown by the invisible rays, both at the ultraviolet and ultrared end of the spectrum. The prevailing temperature is also an important factor in determining the effect of sunlight upon bacteria. At an optimum temperature for the growth of bacteria, the rays of the sun exercise the greatest bactericidal effect.

Intestinal resorption of antitoxins, P. H. Römer (*Sitzber. Gesell. Gesam. Naturw. Marburg, 1906, No. 5, pp. 51–60*).—In this paper a report is given on experiments during which quantitative determinations were made of the antitoxin in the milk of cows which had been treated with tetanus antitoxin. The amount of antitoxin in the blood of calves which sucked these cows was also determined. The cows received an antitoxic serum obtained from horses and this serum was secreted in the milk, being also found later in the blood of the calves. In this passage, however, it undergoes a modification, becoming a bovine antitoxin in the place of the equine antitoxin which the cows received.

Government examination of curative sera, R. Otto (*Arb. K. Inst. Expt. Ther. Frankfurt, 1906, No. 2, pp. 86, figs. 8*).—An account is given of the commercial manufacture of antitoxic and antibacterial sera together with historical notes on the development of a method for the government control of these products. The present report contains a detailed discussion of the routine method by which commercial concerns obtain permission to sell their sera under government inspection and also of the methods adopted for this examination.

The official inspector of sera in Germany takes note of their harmlessness and of their power. In order to be considered harmless, sera must be shown to be clear, free from gross precipitates, bacterial contamination, and toxins. Special attention is devoted to the examination and control of diphtheria and tetanus toxins and of the antibacterial sera used for the control of swine erysipelas, swine plague, hog cholera, fowl cholera, and also of tuberculin.

Annual report of the chief State veterinarian, L. Van Es (*Ann. Rpt. State Vet. N. Dak., 1906, pp. 66, pl. 1*).—Copies are given of the detailed reports by the various district veterinarians throughout the State regarding the health of animals in their localities. Brief notes are also given on the prevalence of scabies in sheep, horses, and cattle, *Sclerostomum armatum*, blackleg, rabies, glanders, and tuberculosis.

Recommendations are made regarding methods of stable disinfection. A copy is given of North Dakota laws relating to the control of animal diseases.

Annual report of the veterinary institute, 1906, J. VENNERHOLM (*Årsber. Vet. Inst. [Stockholm], 1906, pp. 105*).—A brief account is given of the veterinary staff of the institute and notes are presented on the occurrence of the more important infectious and other diseases during the year 1906. The prevalence of various diseases is shown in a series of tables.

A comparative study of tubercle bacilli from varied sources, J. R. MOHLER and H. J. WASHBURN (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 96, pp. 88, pls. 6*).—The investigations reported in this bulletin were undertaken for the purpose of repeating the experiments of Smith and Koch regarding the morphological differentiation of different forms of tubercle bacilli. The literature relating to the subject is critically reviewed. The tubercle bacilli used in the experiments were obtained from cattle, sheep, swine, and man. Pure cultures were made on different media and the morphological characters of the different cultures carefully noted. Inoculation experiments were also made on laboratory animals including rabbits, mice, cats, and dogs, and on goats, sheep, and cattle.

In these experiments it appeared that while the growth, morphology, and pathogenesis of both the human and bovine tubercle bacilli are tolerably constant nevertheless differences appear which make it practically impossible to determine the origin of the bacilli from a consideration of the morphology alone. Similarly with the virulence of tubercle bacilli a wide range of variation was observed in cultures obtained both from bovine and human sources. A small proportion of the bacilli obtained from man are highly pathogenic and some of those obtained from cattle and other domestic animals are of very low virulence. The authors found that there is no character possessed by any of the types of tubercle bacilli in one host that may not occasionally be found in another host. In some cases, human tubercle bacilli corresponded strictly to the type of the bacillus in all respects except their very high virulence. It is believed, therefore, that additional evidence has been obtained justifying the enforcement of sanitary measures against the use of milk and meat of tuberculous animals.

The spread of tuberculosis through factory skim milk with suggestions as to its control, H. L. RUSSELL (*Wisconsin Sta. Bul. 143, pp. 28, pl. 1, fig. 1*).—Attention is called to two common methods of infection of dairy herds, viz., by buying tuberculous cattle and by using tuberculous skim milk in feeding calves.

The tuberculin test was applied on a large scale among the cows which furnished the milk for 3 creameries. In making this test it was soon found that many of the mature animals brought in from outside sources were healthy, while the young stock raised on the farms reacted in a large percentage of cases. In the two localities which furnished milk for two of the creameries 1,213 cattle were tested with the result that 374, or about 30 per cent, reacted. Nearly all of the cattle which reacted were raised on the farm and infection doubtless took place through the skim milk which the calves drank. In another locality where the skim milk was apparently not infected with tuberculosis, at least to the same extent, only 8 per cent of the dairy cattle were found to be tuberculous.

Tuberculosis was also observed in hogs and poultry fed on skim milk products. In eliminating this important source of tuberculosis all that is required is the pasteurization of all skim milk. This can best be done by live steam and a required temperature of 176° F. is suggested. It is believed that the pasteurization of skim milk should not be left as a voluntary matter, but should be made compulsory by law.

Some points in the history of the determination of pulmonary tuberculosis from alimentary infection, A. CHAUVEAU (*Rev. Gén. Méd. Vét., 9 (1907), No. 105, pp. 497–510*).—A brief résumé is given of the work of the author and other investigators in which evidence is offered that a considerable percentage at least of the cases of pulmonary tuberculosis arise from infection through the alimentary tract.

The intestinal origin of pulmonary tuberculosis, GAUTIER (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 8, pp. 199, 200*).—Attention is called to Vallée's confirmation of von Behring's hypothesis that a large percentage of the cases of pulmonary tuberculosis in animals arise from a primary infection in the alimentary tract. Such has been found to be the case in numerous instances. The alimentary tract may show no lesions at the point where the bacilli entered, but frequent involvement of the mesenteric glands is believed by the author to add weight to the theory.

Tuberculosis of the myocardium, W. VANDERBURG (*Tijdschr. Veeartsenijk., 34 (1907), No. 7, pp. 434–439*).—It is of comparatively rare occurrence that the muscle of the heart is involved in cases of tuberculosis. Brief notes are given on cases of this sort in cattle and horses.

The rôle of alcohol in bovine tuberculosis, SPARTZ (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 8, pp. 189, 190*).—Recent experiments have shown almost uniformly that the use of alcohol favors the development of tuberculosis. For obvious reasons this matter has been studied most extensively in man. The author's observations, however, indicate that cows which receive distillery by-products are more susceptible to tuberculosis and are infected in a larger percentage of cases than cattle which do not have these by-products in the ration. In a number of instances herds of cows fed on such products were found to be tuberculous to the extent of 90 to 100 per cent.

The condition of the leucocytes in the presence of encapsuled anthrax bacilli, T. STIENNON (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 13, pp. 646, 647*).—The author's experiments were made on guinea pigs. It appears that anthrax bacilli in capsules are very resistant, and even after being subjected to a temperature of 60° C. for half an hour they are not destroyed by the phagocytes in the peritoneum. Apparently the presence of the capsule protects them from the action of the phagocytes and the exudate in the peritoneum.

Proceedings of a conference of Federal and State representatives to consider plans for the eradication of the cattle tick (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 97, pp. 98*).—A conference was held in Nashville, Tenn., December 5 and 6, 1906, at which representatives of the Bureau of Animal Industry and State authorities interested in the extermination of cattle ticks took part. At this conference the attitude of the Bureau of Animal Industry toward the subject was outlined by A. D. Melvin, and notes on the cooperative work thus far carried on were presented by R. P. Steddom. Such work has been done in nearly all of the Southern States. During the first year of cooperative effort about 549,000 head of cattle have been inspected, and an area of 50,000 sq. miles, covering 45 whole counties and parts of 13 other counties, has been apparently freed from ticks and released from quarantine. These results encourage the belief that with an annual appropriation of $250,000 the cattle tick can be ultimately eradicated.

The legal side of the question was discussed by G. P. McCabe and recommendations made regarding the phraseology of laws intended to permit cooperation between Federal and State authorities. This matter was also referred to by D. F. Luckey. The difficulties met with in the enforcement of quarantine regulations were mentioned by T. Morris, and C. A. Cary called attention to the desirability of giving wide publicity to the work of tick eradication. Reports were received from all of the Southern States regarding the progress of the work.

Methods of eradicating cattle ticks, L. A. KLEIN (*South Carolina Sta. Bul. 130, pp. 17, figs. 3; U. S. Dept. Agr., Bur. Anim. Indus. Circ. 110, pp. 16, figs. 3*).—The desirability of eradicating cattle ticks is set forth in connection with a discussion of the general problems connected with this operation. Cattle ticks should be eradicated for the reasons that they transmit Texas fever, constitute a barrier to interstate traffic in cattle, check the growth and development of all cattle, and prevent to some extent the introduction of a better grade of stock into the South.

It is held that tick eradication is practicable and may be accomplished by a system of rotation of pastures, by the starvation plan, by picking or brushing ticks from the cattle, and by oiling. It is recommended that cattle be examined weekly, beginning about October 15, and treated with crude oil so long as any ticks are found. Under ordinary conditions a thorough application in October will make it unnecessary to give further treatment until March. The oil may be applied with a brush or with a piece of burlap, and all parts of the cow should be covered with it.

East coast fever, J. M. SINCLAIR (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 1, pp. 41–43*).—Notes are given on the prevalence of this disease in Rhodesia. Since 1902 nearly 34,000 cattle have died in Rhodesia from this cause. During the time of its greatest prevalence it was spread largely by the unregulated movement of cattle from place to place, but since quarantine regulations have been established this means of transmission has been eradicated.

Infection with foot-and-mouth disease, C. TERNI (*Clin. Vet. [Milan], 30 (1907), No. 15, pp. 245–254*).—Apparently spontaneous outbreaks of foot-and-mouth disease sometimes occur with more serious symptoms than are manifested in cases which arise by direct contact of healthy cattle with diseased ones. The virus in such cases soon becomes attenuated and incapable of producing an infection except by direct contact. It is believed that in these spontaneous outbreaks the disease is due to the perpetuation of an active virus through the agency of rats.

Gid in calves, P. LEBLANC and FRÉGER (*Jour. Méd. Vét. et Zootech., 58 (1907), Apr., pp. 193–196, fig. 1*).—The comparative infrequency of gid in young calves is believed to be due to the fact that they are kept confined more than lambs and are not attended by dogs. They are therefore less often exposed to infestation from the larvæ of the adult form of the gid worm in dogs.

Treatment of mammitis, SCHULTZE (*Berlin. Tierärztl. Wchnschr., 1906, No. 51, p. 922*).—Contagious mammitis being in most cases due to an invasion of bacteria through the milk canals, the author applied his method of treatment along the same channels. The udder is first thoroughly milked and then cleansed with warm soapsuds and a 3 per cent solution of creolin, after which it is dried. Injections are made into the milk cisterns with solutions containing 5 per cent creolin or camphorated oil. This treatment is repeated 3 times daily and in nearly all cases has brought about prompt improvement.

The etiology of milk fever, E. SONNENBERG (*Berlin. Tierärztl. Wchnschr., 1907, No. 17, pp. 283–286*).—In the study of milk fever undertaken by the author, an attempt was made to determine the effect of the constituents of milk on the physiological functions of experimental animals, particularly rabbits.

From these tests it is concluded that the milk of healthy cows and also of those suffering with milk fever contains proteid substances which produce a typical reaction in rabbits after subcutaneous inoculation. This reaction is shown in the circulatory system and digestive tract. The proteid substances in milk show a chemically toxic effect which persists for only a short time. Apparently the effect is exercised upon the vasomotor nerve center and produces an irritation and paralysis of these structures. According to these experiments, milk fever could be considered as due to an abnormal increase in the quantity of these injurious substances in milk.

The treatment of milk fever, S. R. FERWERDA (*Tijdschr. Veeartsenijk., 34 (1907), No. 7, pp. 444–448*).—Brief notes are presented on the results obtained in the treatment of 160 cases of milk fever by means of air pumped into the udder. In nearly all of these cases marked improvement was observed within a few hours and only 1.3 per cent of the cows died.

The treatment of infectious vaginitis, J. VLASKAMP (*Tijdschr. Veeartsenijk., 34 (1907), No. 7, pp. 439–444*).—The symptoms of infectious vaginitis are briefly described and notes are given on the occurrence and spread of the disease. The author obtained best results in treating the disease from the use of an ointment containing pyoctanin. In these experiments ichthyol was not used, but it is believed that this might also be of some benefit.

Different species of trypanosomata observed in bovines in India, A. LINGARD (*Jour. Trop. Vet. Sci.. 2 (1907), No. 1, pp. 4–50, pls. 3*).—A long series of observations has been made on trypanosomata as found in various bovines in India of the hill and plains types. The species of trypanosomes thus far observed include *T. evansi*, *T. himalayanum*, *T. muktesari*, and *T. indicum* in hill cattle, the last-named species being also found in plains cattle.

The methods of reproduction and other points in the biology of the observed trypanosomes are discussed in detail, and a table is given showing the average measurements of different species.

Observations on some worms found in the aortas of buffaloes and bullocks, G. L. TUCK (*Jour. Trop. Vet. Sci., 2 (1907), No. 1, pp. 69–100*).—Two species of parasitic worms belonging to the family Filariidæ were found, one in the aortic walls of the buffalo and one in domestic cattle. A large percentage of buffalo and cattle was found to be infested with these worms. Each small tumor in the aortic or arterial wall contained a single parasite.

A detailed description is given of the anatomical features of the aorta and of the minute characters of the parasitic worms. The anatomical features of these parasites are shown by way of comparison in tabular form.

Nodules containing larval nematode worms in the intestinal submucosa of a bullock, J. B. CLELAND (*Jour. Trop. Vet. Sci., 2 (1907), No. 1, pp. 67, 68*).—In the course of meat inspection a number of small nodules were found in the submucosa of the small intestine of a beef animal. The nodules were readily movable and appeared to be in close relation with the blood vessel in every case. Each nodule contained 1 or 2 nematode worms which have thus far not been identified.

Trichinosis: A danger in the use of raw pork for food, B. H. RANSOM (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 108, pp. 6, figs. 5*).—The trichina is described in its 3 stages and notes are given on the symptoms of trichinosis in man, its treatment, and the frequency of the occurrence of the disease in man and hogs.

In preventing this disease in man, attention is again called to the fact that no further precaution is necessary than the thorough cooking or preparation of pork before it is eaten. The trichinæ are killed with certainty either by thorough cooking or curing.

The etiology of hog cholera, SCHREIBER (*Berlin. Tierärztl. Wchnschr., 1907, No. 18, pp. 299–301*).—The author has succeeded in producing both the chronic and acute forms of hog cholera by experimental inoculation with pure cultures of *Bacillus suipestifer*. Success was also had in producing an active immunity by means of the hog cholera bacillus and a passive immunity by means of the corresponding serum.

The author takes the position that *B. suipestifer* must be looked upon as the true cause of hog cholera. It is admitted that the filterable virus is capable of producing hog cholera, but the author considers this virus as being a toxin formed by the interaction of the organism and the hog cholera bacillus, and classifies it as an aggressin in the sense of Bail.

Purulent inflammation of the inner ear in hogs, A. M. BERGMAN (*Fortschr Vet. Hyg., 4 (1907), No. 11, pp. 241–243, figs. 3*).—The literature relating to this disease in other animals is briefly mentioned. Apparently no cases had previously been recorded in hogs. The author describes a number of cases in which the head was twisted to one side as the result of the trouble. A microscopic examination of the tissues from the inner ear showed that in the 3 cases thus studied the swine plague bacillus and also *Bacillus pyogenes* were present.

The penetration of dead glanders bacilli through the intestinal wall, J. CANTACUZÈNE (*Compt. Rend. Soc. Biol.* [*Paris*], *61 (1906), No. 37, pp. 618–620*).—Dead glanders bacilli were found capable of passing through the intestinal epithelium. A certain portion of the bacilli after passing through the epithelium were captured by phagocytes, but some of them succeeded in escaping and entering the lymph system. The ordinary intestinal bacteria associated with the dead glanders bacilli were not able to pass by the phagocytes.

Some remarks on equine biliary fever in India, C. H. H. JOLLIFFE (*Jour. Trop. Vet. Sci., 2 (1907), No. 1, pp. 51–66*).—Equine biliary fever prevails quite widely in various parts of India and at times causes serious losses among horses. Notes are given on the symptoms and pathology of these diseases, differential diagnosis, and treatment. Thus far quinin has given the best results in the treatment of the disease, but a really satisfactory treatment has not been devised.

The pathological anatomy of the Borna horse disease, H. OPPENHEIM and R. OSTERTAG (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 2–3, pp. 148–157, figs. 3*).—The pathological lesion in this disease may be characterized as a not diffuse but localized meningocephalitis of an acute but nonpurulent nature. The clinical symptoms and pathological findings are described in detail.

The Trypanosoma equiperdum in Canada, J. G. RUTHERFORD (*Vet. Rec., 19 (1907), No. 982, p. 710*).—It is announced that the protozoan parasite of dourine has been isolated from a case of this disease in Canada and has been recovered from another horse inoculated with material from the first case.

The treatment of infectious cerebro-spinal meningitis of horses, E. DIEM (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 16, pp. 301–303*).—In the region about Burghausen it is stated that this disease is quite prevalent. The author has had occasion to treat numerous cases. The treatment recommended is essentially as follows: The horses are kept in well-ventilated, cool stalls and allowed to feed only on grass or hay. An abundant supply of water is provided to which certain mineral salts may be added. On 3 days in succession injections are made of bichlorid of mercury in doses of 0.1 gm. in 10 cc. of water to which a little common salt has been added. This method has been tested for 4 years and in nearly all cases a complete recovery has been brought about.

Inflammatory tumors caused by spiroptera in the horse, WEINBERG (*Compt. Rend. Soc. Biol.* [*Paris*], *62 (1907), No. 7, pp. 287–289*).—A number of nematode worms are known to live as parasites in the stomach of the horse and occasionally they bury themselves in the mucous membrane in such a manner as to produce tumors, with more or less serious effects. This is especially the case with spiroptera. During the formation of the tumors thus produced opportunity is given for infection with pathogenic bacteria,

A study of Babesia canis, K. Kinoshita (*Arch. Protistenk., 8 (1907), No. 2–3, pp. 294–320, pls. 2*).—The various forms assumed by this organism in its different developmental stages are described in detail and the literature of the subject is discussed in connection with a short bibliography. The material was obtained from dogs suffering from spontaneous cases of piroplasmosis or as a result of inoculation.

The decomposition of rabies virus in vitro by means of radium, G. Tizzoni and A. Bongiovanni (*Atti R. Accad. Lincei Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 16 (1907), I, No. 7, pp. 485–492*).—When 20 mg. of bromid of radium were added to 5 cc. of distilled water and 1 cc. of an emulsion of rabies virus was allowed to remain in this solution for 24 hours the virulence of the virus was not reduced in the manner described by Rehn. Negative results were obtained in all instances. The animals inoculated with virus treated with radium died of rabies after the same period of incubation as was shown by control animals.

Rectal vaccination for rabies, P. Remlinger (*Compt. Rend. Soc. Biol.* [*Paris*], *62 (1907), No. 14, pp. 722, 723*).—On account of favorable results obtained from rectal injections of antituberculous serum in the treatment of tuberculosis, the author thought it desirable to test this method of vaccination for rabies. Experiments were carried out on rabbits which received a rabid hemisphere or whole brain in an emulsion of 20 cc. of water at repeated intervals of 1 week. In cases where the mucous membrance was injured to the slightest extent an infection took place in about 1 out of 5 cases. It is found possible, however, to produce an immunity by this method.

A peculiar blood condition, probably parasitic, in Sudanese fowls, A. Balfour (*Jour. Trop. Med. and Hyg.* [*London*], *10 (1907), No. 9, pp. 153–157, figs. 5*).—A disease was noted in fowls which resembles spirillosis in symptoms, the most striking of which were anemia and pronounced stupor. An examination of the blood showed the presence of corpuscles affected with organisms which may prove to be blood parasites. The supposed parasites were found in the blood corpuscles outside of the nucleus in numbers varying from 1 to 7. Gross post-mortem lesions are not striking aside from the general anemia and a congestion of the liver, kidneys, and lungs. The parasites apparently belong to Piroplasma and are believed to be carried by *Argas persicus.*

Quail disease in the United States, G. B. Morse (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 109, pp. 11, figs. 3*).—Quail disease, due to a micro-organism belonging to the group of coli bacillus and characterized by congestion of the lungs, necroses of the liver, and intestinal ulceration, is reported as having occurred in 1906 in Alabama, Kansas, Indian Territory, Virginia, District of Columbia, Massachusetts, and Nova Scotia. The disease affected the common bobwhite, California quail, and other western species of quail and grouse.

The period of incubation appears to be about 10 days. No curative treatment has been devised. Occasionally the disease runs a chronic course but as a rule the birds die within 2 or 3 days, the chief symptoms being dullness and a tendency to remain motionless. The quail disease is recognized as a serious menace to the propagation of these birds. In preventing the spread of the disease, therefore, it is necessary to give close attention to birds kept in captivity and isolate all suspected birds promptly, after which the quarters are to be disinfected.

RURAL ENGINEERING.

Mechanical tests of pumping plants in California, J. N. Le Conte and C. E. Tait (*U. S. Dept. Agr., Office Expt. Stas. Bul. 181, pp. 72, figs. 10*).—This is a report of mechanical tests of pumping plants made as a part of the cooperative irrigation investigations of this Office and the State of California and includes 38 complete tests and more than 100 partial tests, the complete tests showing efficiency and fuel consumption, and the partial tests the work done, fuel consumption, cost of plant, and cost of operation. The power used included gasoline and steam engines and electric motors, and the types of pumps centrifugal, rotary, deep-well, and air-lifts. The efficiencies given are the combined efficiencies of engines, transmission, and pumps, being the ratio between the indicated horsepower and the actual work done in lifting water.

Complete tests were made of 9 plants with gasoline engines running centrifugal pumps, and 2 plants with gasoline engines running deep-well pumps. The efficiencies of the centrifugal-pump plants varied from 20 to 49 per cent, the average being 34 per cent. With the deep-well pumps the efficiency was 33 per cent in one case and 52 per cent in the other, averaging 43 per cent.

The electrically driven plants tested included 7 centrifugal pumps, 1 screw pump, 2 deep-well pumps, 1 triplex pump, and 1 rotary pump. The efficiencies of the plants were as follows: Centrifugal, from 17 to 55 per cent, averaging 41 per cent; screw pump, 30 per cent; deep-well, 37 and 41 per cent, averaging 39 per cent; triplex 53 per cent, and rotary, two tests of same plant, 54 and 49 per cent, averaging 51.5 per cent

The steam-driven pumps included 7 centrifugal pumps, 2 plunger pumps, and 3 air lifts. All these plants used crude oil for fuel. The plant efficiencies were as follows: Centrifugal, 34 to 60 per cent, averaging 47 per cent; plunger, 93 and 91 per cent, averaging 92 per cent; and air lifts 16 to 18 per cent, averaging 17 per cent. It should be remembered that these are tests of plants in actual operation, and they probably represent very well what may be expected from plants of this type under field conditions. For the plants using centrifugal pumps the plant efficiency does not seem to differ definitely from that for gasoline or electric plants. The plant efficiency of the plunger pumps was much higher than for any other type, while for the air-lift plants it was very much lower.

The amount of crude oil consumed varied from over 0.8 gal. per indicated horsepower hour for the smallest plant to a little over 0.2 gal. for the largest plant. For those using centrifugal pumps the amount of crude oil used per useful water horsepower hour varied from 2.5 gal. for the smallest plant to about 0.5 gal. for the most economical plants. A comparison with gasoline engines of corresponding size showed that at least four times as much crude oil was required when burned under a steam boiler as was needed of gasoline when used in an internal-combustion engine. When steam plants run intermittently considerable fuel is required in getting up steam preparatory to starting the plant, so it is probable that in such cases the actual performance of the plants requires more fuel in proportion to the work done than is shown in the tests.

A comparison of the results obtained with centrifugal pumps using gasoline, electricity, and steam as motive power shows that, at the prevailing prices, to raise 1 acre-foot of water 1 ft. the cost of gasoline varies from 1½ to 5 cts., of electricity, from 4½ to 10 cts., and of crude oil for generating steam from 1½ cts. upward. The total cost, according to the rates used for fixed charges and the figures obtained for attendance and maintenance, of raising 1 acre-foot of water 1 ft. for gasoline plants varies from 4 cts. upward, for electrical plants from 7 to 16 cts., and for steam plants from 4 cts. upward.

In addition to the complete tests discussed above, fuel and water tests were made on plants immediately about the city of Pomona, Cal. In each case the measurements were made showing the work done or water horsepower and the fuel consumed, the results being stated with gasoline in gallons per useful water horsepower hour, with electricity in kilowatts per useful water horsepower hour, and with steam plants using crude oil in gallons per useful water horsepower hour.

Forty-seven plants having gasoline engines running centrifugal pumps varying in size from 1½ in. to 6 in. showed consumptions running from 0.228 gal. to 2.414 gal. per useful water horsepower hour, the largest consumption being with the smallest pump, and being more than ten times as large as the smallest consumption. The average consumption was 0.52 gal. per useful water horsepower hour. This is approximately 0.7 gal. to raise 1 acre-foot of water 1 ft.

There are reported 41 plants having gasoline engines and deep-well pumps. The fuel used per useful water horsepower hour varied from 0.185 gal. to 4.81 gal., the average being 0.563 gal. This equals approximately 0.77 gal. per acre-foot raised 1 ft. This is slightly higher than the consumption with centrifugal pumps.

Thirty electrically driven plants were tested, 17 having centrifugal pumps and 13 having deep-well pumps. The power used per useful water horsepower with centrifugal pumps ranged from 1.36 to 3.19 kilowatts, averaging 2.12 kilowatts; with deep-well pumps it ranged from 1.11 to 2.05 kilowatts, averaging 1.5 kilowatts. The advantage in this case is with the deep-well pumps, while with the gasoline engines there was a slight advantage with the centrifugal pumps.

Eleven steam-driven plants were tested, 3 having centrifugal pumps and 8 having air lifts, the average consumption of oil per useful water horsepower hour with the centrifugal pumps being 1.74 gal. and with the air lifts 1.59 gal., the advantage being with the air lifts.

The most striking point shown by the tables is the extreme variation in fuel consumption between the most economical and the most wasteful plants of the same type. As already noted, the highest consumption in the gasoline plants was more than ten times the lowest while the average was but little more than one-fifth of the highest consumption and slightly more than twice the lowest, indicating that proper adjustment and care might on the average reduce the fuel consumed by one-half.

The report gives also a large amount of data regarding the cost of pumping plants and the cost of attendance and repairs, and other interesting facts regarding pumping water for irrigation.

Mechanical tests of pumps and pumping plants used for irrigation and drainage in Louisiana in 1905 and 1906, W. B. GREGORY (*U. S. Dept. Agr., Office Expt. Stas. Bul. 183, pp. 72, figs. 4*).—The Louisiana tests, like the California tests reported above, show the efficiency of the engines, transmissions, and pumps, and the fuel consumption. With 2 exceptions, the plants tested had steam engines and used crude oil for fuel. Twelve plants had centrifugal pumps and 3 had rotary pumps. The most significant point in the results is the high efficiency of the rotary pumps, one showing 81.7 per cent efficiency, and another 83.3 per cent; the third, however, showed only 30.1 per cent efficiency. The efficiencies of the centrifugal-pump plants ranged from 5 to 68 per cent. The pump showing only 5 per cent efficiency was so badly adjusted that the runner wore a hole through the casing and is not included in the average which follows. The next lowest efficiency was 20.8 per cent, the average for 11 plants being 47 per cent. This is exactly the efficiency found for steam-driven centrifugal pumps in the California tests, the fuel being crude oil in both cases.

In this report fuel consumption is given in pounds. If these are reduced to gallons the oil used per useful water horsepower hour with centrifugal pumps ranges from 0.29 gal. to 3.66 gal., averaging 1.1 gal. The 3 rotary pumps showed a consumption of 0.35 gal., 0.27 gal., and 2.53 gal., the average being 1.06 gal., and the 2 lowest consumptions averaging 0.31 gal. Among all the tests the lowest consumption is with a rotary pump, 0.27 gal., and the next lowest is with a centrifugal pump, 0.29 gal. Here, as in California, the most notable feature is the wide variation with plants of the same type, the highest consumption with centrifugal pumps being 12.5 times the lowest.

The average fuel consumption by the plants tested in Louisiana is lower than the average of the California plants, the steam-driven centrifugal plants in California showing an average consumption of 1.74 gal. per useful water horsepower.

The author interprets his results by assuming plants of different types and figuring first cost and operating expenses, using the results of his tests. The results are also used in making a diagram showing the cost of fuel and the total cost of irrigation per acre under varying conditions.

Drainage conditions of Wisconsin, A. R. WHITSON and E. R. JONES (*Wisconsin Sta. Bul. 146, pp. 47, figs. 15, map 1*).—This bulletin describes briefly the soils of Wisconsin and discusses the fertility and drainage of the marsh and clay lands of the State on the basis of greenhouse and field experiments made on typical soils of each class.

The marsh lands are classified in two groups with regard to fertility and drainage conditions: "First, those of the sandstone and granitic regions, in the central and northern portions of the State; and, second, those of the glaciated limestone region of the eastern and southeastern portions."

The clay soils are divided into six groups: (1) Last glacial clay on limestone, (2) red-clay area, (3) old glacial clay on crystalline rocks, (4) last glacial clay on crystalline rock, (5) old glacial clay on limestone and sandstone, and (6) residual clay limestone.

The marsh soils "must be drained in order to be brought under cultivation and their reclamation therefore adds to the total amount of land under cultivation. There is, however, a large part of the upland clay soils, already under cultivation, with a surface and under drainage which is so poor that they would be greatly benefited by tile drainage."

Under present conditions as to value of land and crops and price of labor, the authors conclude that:

"Reclamation by drainage will make 2,000,000 acres of peat and muck lands in the central and northern part of the State fairly productive lands.

"Drainage of the marsh lands in the southeastern part of the State will make nearly two-thirds of a million acres as valuable as any class of lands in the State.

"The amount of clay lands needing tile drainage and the total benefits derived from such drainage are nearly twice as great as in the case of marsh lands.

"A fair estimate of the amount of land needing drainage, of the cost, and of the benefits above cost is given in the following table:

"Acreage of poorly drained land of each type, together with cost and profit of drainage.

Kind of soil.	Number of acres.	Cost of drainage	Profit above cost.
Peat and muck on sand and granitic area	2,000,000	$10,000,000	$20,000,000
Muck and peat on limestone area	610,000	18,300,000	24,000,000
Clay of last glaciation on limestone	1,500,000	11,250,000	30,000,000
Red clay of Superior and Green Bay region	1,300,000	9,750,000	13,000,000
Old glacial clay on granitic area	1,000,000	11,250,000	15,000,000
Last glacial clay on granitic area	600,000	8,600,000	6,000,000
Old glacial clay on limestone	50,000	350,000	1,000,000
Residual clay on limestone	300,000	2,250,000	5,000,000
Total	7,360,000	66,750,000	114,000,000

"The writers know of no other way in which so great an increase in the productive power of the agricultural lands of Wisconsin can be effected as by drainage."

RURAL ECONOMICS.

Report on the decline in the agricultural population of Great Britain, 1881–1906, R. H. REW (*Bd. Agr. and Fisheries [London], 1906, pp. 143, figs. 2, map 1*).—The census returns of Great Britain for the period 1881–1901 show a decrease of 294,627 agricultural laborers, and the returns from this inquiry, which were secured from 248 correspondents, indicate "that since 1901 there has been some further reduction in the number of men employed on farms, but that the diminution is proceeding at a slower rate than during the 10 or 20 years preceding that date."

The causes assigned for this continuing decline in farm labor are the laying down of arable land to grass, the use of improved machinery, the higher wages and superior social advantages afforded by employment in other industries, a deficiency of satisfactory housing accommodation, the few opportunities for financial advancement, a deficiency of small holdings in some counties, and a lack of money on the part of those who would take up small holdings. On the other hand, encouragement for the future is found in the fact that farmers are adapting themselves to changed conditions by taking up "the cultivation of fruit and vegetables, the rearing of poultry, and other industries of a so-called subsidiary character." This transition is expected to furnish new fields of employment to labor.

A large part of the volume is taken up with a summary of the reports of the correspondents, including their names and addresses. Appendix A gives the census statistical data regarding the number of farmers and laborers, acreage of arable and grass lands, number of cattle and sheep, and number of agricultural holdings in each county of Great Britain for the period under discussion.

The decline in number of agricultural laborers in Great Britain, EVERSLEY (*Jour. Roy. Statis. Soc., 70 (1907), No. 2, pp. 267–319*).—The author discusses the causes of this decline and aims to show what has become of the laborers who have left the farm.

Of 130,000 laborers who have been withdrawn in England and Wales in the 20 years from 1881 to 1901, it is claimed that about 56,000 engaged in intensive gardening, while 74,000 found employment at higher wages in avocations and industries where physical strength is necessary—on the railways, in the rural police, as carmen, and as laborers in towns.

In the author's opinion the remedy for the decline of agricultural laborers lies "in the direction of intense cultivation in connection with small holdings, under the stimulus of ownership, or of security of tenure different from that of yearly tenancy, which is the rule with larger farms under the system of British agriculture." This he believes would give a greater employment of labor on the land and ultimately produce a vigorous and independent rural population.

The scarcity of farm help in Hungary (*Wiener Landw. Ztg., 57 (1907), No. 38, pp. 363, 364*).—This article points out the effects of labor agitation and foreign emigration on rural depopulation in Hungary and outlines the measures adopted by landowners and the government to meet this lack of farm labor.

In brief, the remedies consist in the importation of foreign farm help and the governmental regulation of the relations between landowners and laborers, including penalties for the violation of contracts and means for the better housing of laborers. The latter is regarded as especially likely to stop foreign emigration and cause the ultimate return of the people to the land.

A guide for immigrants and settlers, P. HUNTER ET AL. (*Sydney: Govt., 1906, pp. VIII + 418, pls. 31, figs. 329, map 1*).—This gives a history of the agricultural development of New South Wales, points out its industrial and agricultural possibilities, and gives suggestions to immigrants who intend to engage in agriculture. Information is given regarding the methods of acquiring land and of securing advances by settlers.

Reports on land settlement in Southern Rhodesia, 1906–7, C. D. WISE (*Rpts. Land Settlement So. Rhodesia, 1906–7, pp. 29*).—On the basis of personal observations of the agricultural possibilities of the country, the author recommends a system of land settlement in brief as follows:

The establishment of a central farm by the British South Africa Co. of not less than 5,000 acres to serve as an experimental and training farm for prospective settlers; the allotment of farms to settlers of from 1,000 to 1,500 acres in size with alternate blocks of similar size reserved by the company; the selection of practical farm hands only as settlers; the erection of temporary huts, with a view to the health and social intercourse of the settlers; the encouragement of diversified farming under irrigation wherever feasible; financial aid to farmers in a way to stimulate self-help and independent action; and supervision of the settlers' farms by the company's hired manager, with a view of giving advice where needed.

The recommendations as to advances to settlers are made for the purpose of protecting the company while making repayment as easy as possible.

The agricultural wealth and development of Western Siberia, H. C. CARPENTER (*Amer. Exporter, 60 (1907), No. 1, pp. 3–6, figs. 10*).—This is a description of the area, geological characteristics, mineral resources, and agricultural possibilities of Western Siberia.

Under native or Kirkhiz occupation this vast territory was agriculturally neglected with the exception of the raising of live stock, but in recent years farmers from Russia, Germany, Denmark, Norway, and Sweden have settled there and introduced modern methods of culture and machinery. "Their example has been of great value to the Siberian peasants in teaching methods of up-to-date farming. . . . The American observer is, however, forcibly struck by the comparatively small development that has taken place in this region of unexplored riches and by the marvelous opportunities that await intelligent efforts and capital."

Agriculture in Central Spain, A. A. DE ILERA (*Ann. Gembloux, 17 (1907), No. 4, pp. 196–217, figs. 2, map 1*).—The author describes the geography, climate, river systems, and general agricultural conditions of this region, which embraces more than half of Spain.

Agriculture is confined largely to small farms, which are worked with crude implements. Occasionally farms ranging from 50 to 150 hectares are owned or worked by individuals with modern machinery, but rarely is a farm found of more than 150 hectares. The system of farming on shares is largely practiced. Wages of regular farm hands range from 8¾ to 12¼ francs per week in autumn and winter, and from 10½ to 15¾ in spring. During the harvest season piecework is the general rule when farm hands receive from 125 to 150 francs for six weeks' or two months' work with board included. The fare provided for farm help is said to be excellent. Educational institutions for promoting agriculture are few in number.

To give a new impetus to agriculture in Spain the author recommends reforestation, the construction of irrigation works and the more general practice of irrigating crops, the extension of agricultural instruction especially in the common schools, road improvement, the organization of agricultural credit by means of Raiffeisen or similar banks, and agricultural cooperaton.

Report on the condition of agriculture in East Flanders during 1906 (*Rap. Agr. Flandre-Orientale, 1906, pp. 79*).—This includes statistics on the yields of field crops and fruits, and on horse and cattle breeding, together with notes on the weather conditions affecting agriculture, new methods of culture, agricultural industries and associations, etc.

International cooperative bibliography (*London: International Cooperative Alliance, 1906, pp. XXXVII + 276*).—A list of 5,761 entries on cooperative literature. Agriculture proper has 915 entries and rural credit societies 557 entries—a total of 1,472. This places agriculture in the lead of all other forms of cooperation. France heads the list in respect to cooperation applied to agriculture, Italy in regard to credit cooperation, and the United Kingdom in general subjects and distribution.

Agricultural credit in Germany, W. FAWCETT (*West Indian Bul., 7 (1906), No. 4, pp. 317–323*).—Statistics are presented on the growth of credit societies in Germany, with particular reference to the operations of the Schulze-Delitzsch, Raiffeisen, and other cooperative and state banks. On January 1, 1905, there were 1,595 societies for the purchase of agricultural supplies, 3,062 societies for the manufacture of dairy and other products, and 682 other agricultural societies. The members of these societies secure credit through the Raiffeisen local banks connected with central or district banks. Loans are advanced only for reproductive purposes. The administration of the local banks is honorary, "no salary being paid except a trifling sum to the secretary, and all profits realized go to a reserve fund."

Agriculture in our industries (*U. S. Dept. Agr., Office Sec. Circ. 23, pp. 8*).—A speech delivered by the Secretary of Agriculture at Pittsburg, Pa., April 27, 1907, in which a brief account is given of some of the lines of work of this Department and their practical application in the beet sugar, denatured alcohol, rice, matting, camphor, cotton, and tobacco industries, the control of animal diseases, the maintenance of the nitrogen supply, the purification of water systems, the transportation of perishable crops, and in other ways.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 9 (1907), No. 7, pp. 49–56*).—Statistics on the condition, acreage, and prices of agricultural products in the United States and foreign countries are summarized and discussed.

The yields in German agriculture during the last generation, E. WEHRIEDE (*Landw. Jahrb., 36 (1907), No. 1, pp. 99–184*).—Statistical data with discussion of the number of hectares under cultivation, the yields of the principal field crops, the industrial products of agriculture, the development in animal industry, prices of commercial fertilizers and feeding stuffs, etc., from 1870 to 1904, inclusive. The yields are discussed in relation to the law of diminishing returns in agriculture. A bibliography of German agricultural statistics is appended.

Cereal production in 1906 (*Veroffentl. K. Ung. Ackerb. Min., 1907, No. 6, pp. 21*).—The acreage and yields of wheat, rye, barley, oats, and corn in the various grain-producing countries of the world are tabulated and discussed. In some instances similar data regarding potatoes are included.

Statistics of the most important branches of agriculture in Bohemia for the season of 1905–6 (*Mitt. Statis. Landesamt. Böhmen, 10 (1907), No. 1, pt. 2, pp. 53*).—Statistics of yields and acreage under cereal and other crops, including the extent of fallow land, meadows, and beet-sugar production.

Trade and agriculture of the consular district of Odessa for the year 1906, C. S. SMITH ET AL. (*Diplo. and Cons. Rpts. [London], Ann. Ser., 1907,* *No. 3834, pp. 55*).—Statistical data with discussion of the trade relations, which are largely confined to agricultural products, and include the yields, exports, and imports for the year 1906.

Notes are given on the agrarian question, the operation of the state peasant bank, and the antiquated cropping system of the Russian peasantry. Improved methods of cultivation and a better system of rotation of crops are urged as means of solving the agrarian question and improving the lot of the peasantry. Under the present system of cropping one-third of the cultivated area lies fallow, but if the Russian peasants would adopt the intensive system as practiced in Germany, "they would be able to increase the growing area of their present holdings by something like 30 per cent, equivalent to an increase of 49,500,000 acres."

The price of cereals at St. Étienne during three centuries, M. L. J. Gras (*Ann. Soc. Agr.* [*etc.*] *Loire, 2. ser., 26* (*1906*), *No. 2, pp. 137–154*).—The prices of wheat, rye, and oats to the close of the year 1905 are reported and discussed.

AGRICULTURAL EDUCATION.

The man who works with his hands (*U. S. Dept. Agr., Office Sec. Circ. 24, pp. 14*).—This is the address of President Roosevelt at the semicentennial celebration of the founding of agricultural colleges in the United States, at Lansing, Mich., May 31, 1907 (E. S. R., 18, pp. 906–908).

Proceedings of the twentieth annual convention of the Association of American Agricultural Colleges and Experiment Stations held at Baton Rouge, La., November 14–16, 1906, edited by A. C. True, W. H. Beal, and H. C. White (*U. S. Dept. Agr., Office Expt. Stas. Bul. 184, pp. 132, fig 1*).—An account of this convention has been given (E. S. R., 18, pp. 406–416).

Proceedings of the eleventh annual meeting of the American Association of Farmers' Institute Workers, W. H. Beal and J. Hamilton (*U. S. Dept. Agr., Office Expt. Stas. Bul. 182, pp. 90*).—This includes the usual reports from the different States and Territories, the reports of standing and special committees, and papers and addresses on the work of the Illinois Association of Domestic Science on what the institute can do to improve the rural school, to interest the town and city resident in rural life, and to improve and increase crops and live stock, on cooperation in purchasing supplies and marketing products, on the improvement of county fairs, on the farm home, and on the relation of institutes to other extension work.

Agriculture for the high school, K. L. Hatch (*Wis. Jour. Ed., 39* (*1907*), *No. 4, pp. 155, 156*).—The author suggests four lines of work for a high school course in agriculture of not less than one year, viz, a study of the scientific principles underlying the subject, the application of these principles to economic agriculture, illustrative or laboratory work, and collateral reading.

Exercises in elementary agriculture, D. J. Crosby (*U. S. Dept. Agr., Office Expt. Stas. Bul. 186, pp. 64, figs. 40*).—This is a series of exercises showing what may be done with inexpensive apparatus in teaching elementary agriculture in the better grade of common schools. It is intended as a laboratory aid for the teacher, and presents a series of 54 progressive exercises in plant production, including 23 on the growth, nutrition, and reproduction of plants and 23 on the environment of the plant, besides a series of 8 brief elementary lessons on corn by G. F. Warren. There is also a list of text-books and works of reference suitable for the common school library.

Agricultural education and the farmer's son, A. D. Hall (*Jour. Farmers' Club* [*London*], *1907, Mar., pp. 559–576*).—An address before a farmers' club in which attention is called to some of the difficulties arising from the lack of central direction to agricultural education in England.

Agricultural education of collegiate grade is said to be fairly well provided for, but that of secondary and elementary grade, as carried on by the different county councils, is not symmetrically developed. Answers are given to some of the objections offered to agricultural education, notably to the one that successful farming can not be taught in the college. It is stated that with many men successful farming consists not in clever management of land or stock, but in continually getting the better of their neighbors in a bargain, and if money making is to be the test of good farming, a strong will and a tough conscience are far better equipments than any education or science. The thing most needed " is not so much the actual knowledge acquired during a college training as the scientific habit of mind and the training in exact thinking. . . . This habit of mind shortens the time required to gain experience; the scientifically educated man has his observation quickened and fits the facts he sees into a rational system, so that he makes use of experience much more rapidly than the untrained man."

The methods of teaching are discussed, and in this connection the writer recommends that the courses be made more technical, that less time be spent upon the pure sciences and more upon the science of agriculture. In chemistry, for example, " reduce the range of the curriculum to the minimum necessary for the comprehension of the technical course that follows, but that minimum should be taught with such thoroughness and with such a mixture of practical work on the pupil's part as will give him a feeling for scientific method and a respect for accuracy of working." The teachers of agriculture should not depend so much upon text-books, most of which are antiquated, but should do some research work and come into contact with improved methods of farming. A plea is also made for more attention to a rational system of bookkeeping and for instruction dealing with agricultural implements and machines.

Attention is called to the danger of leading students to dabble in so many related sciences that they lose sight of the more important features of agricultural education. This is largely due, in his opinion, to the general examination for the national diploma, which he characterizes as " the most serious hindrance to the progress of agricultural education our colleges are faced with to-day."

Country life and rural education, C. S. Plumb (*Breeder's Gaz., 51 (1907), No. 14, pp. 789, 790, fig. 1*).—The difficulty of keeping children on the farm is attributed largely to the kind of training they receive in rural schools. The remedies suggested are instruction in nature study and elementary agriculture. The work along this line of A. B. Graham, in Clark Co., Ohio, is described.

How to interest district school pupils in the study of agriculture, Gusty van Roy (*Wis. Jour. Ed., 39 (1907), No. 4, pp. 129–131*).—An account of a teacher's experience in teaching elementary agriculture by the nature-study method.

The Home Gardening Association (*Ann. Rpt. Home Gard. Assoc., 7 (1906), pp. 32, figs. 27*).—A report upon the various activities of this association for 1906, including seed distribution, lectures, school gardens and grounds, flower shows, the exchange garden, neighborhood and ward gardens, the use of vacant lots, and training for gardening.

[Report of] the professor of nature study, S. B. McCready (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 32 (1906), pp. 228–236*).—This report shows satisfactory progress in nature-study work, there having been a total attendance of 78 teachers at the spring, summer, and fall sessions. Special equipment is described.

Very few schools have taken advantage of the liberal offer of the Department of Education for the acquisition of an acre of ground for gardening purposes, so that the formal school garden on the school grounds is practically unknown. The horticultural societies have been quite successful in inducing children to grow flowers at home. In Nova Scotia, however, many of the schools have gardens.

MISCELLANEOUS.

Annual Report of Alaska Stations, 1906 (*Alaska Stas. Rpt. 1906, pp. 75*).—A report of the several lines of work carried on during the year at the Sitka, Copper Center, Rampart, and Kenai Stations. In addition to extensive tests of field and horticultural crops and the collection of meteorological data, articles on which are abstracted elsewhere in this issue, experiments in soil inoculation were carried on and an unsuccessful attempt at bee keeping at Sitka is reported. During the year a herd of 11 Galloway cattle was introduced into the Territory with the object of providing a hardy breed suitable for the conditions and of developing an all-purpose breed from the Galloway. Butter of excellent quality and some very good cheese was made at Kenai.

Nineteenth Annual Report of Kansas Station, 1906 (*Kansas Sta. Rpt. 1906, pp. 29*).—This contains a financial statement for the year ended June 30, 1906, a report of the council including abstracts of bulletins issued during the year, brief summaries of the work of the different departments not reported upon in bulletins, a report on the work of Fort Hays Branch Station, and a statement concerning cooperative experiments with this Department.

The report is also issued in bound form, including, in addition, reprints of the bulletins issued during the year, an index of the report and these bulletins, a subject list of the station publications to date, and reprints of the press bulletins issued during the year.

Fourteenth Annual Report of Minnesota Station, 1906 (*Minnesota Sta. Rpt. 1906, pp. XXII + 361, pls. 2, figs. 299*).—This contains the financial statement for the fiscal year ended June 30, 1906, a list of bulletins published during the year, the report of the director, including summaries of the work of the different divisions and of the northwest and northeast experiment farms, and reprints of Bulletins 93–96.

Seventeenth and Eighteenth Annual Reports of New Hampshire Station, 1905–6 (*New Hampshire Sta. Bul. 129, pp. 231–275*).—This contains the organization list of the station, financial statements for the fiscal years ended June 30, 1905 and 1906, and brief reports of the director and heads of departments, portions of which are abstracted elsewhere in this issue.

Seventeenth Annual Report of Oregon Station, 1905 (*Oregon Sta. Rpt. 1905, pp. 80*).—This includes the financial statement for the fiscal year ended June 30, 1905, and brief reports of the director and heads of departments. Portions of the report of the chemist are noted elsewhere in this issue.

Eighteenth Annual Report of Oregon Station, 1906 (*Oregon Sta. Rpt. 1906, pp. 20*).—This report on the college and station includes a financial statement for the year ended June 30, 1906, and a report of the director on the work and needs of the station.

Accessions to the Department Library, January–March, 1907 (*U. S. Dept. Agr., Library Bul. 63, pp. 64*).

NOTES.

Alabama College and Station.—Recent appointments include Dr. W. E. Hinds, formerly connected with the cotton boll weevil investigations of the Bureau of Entomology of this Department, as professor of entomology and entomologist; J. W. Ridgeway, a graduate of the Mississippi College, as assistant in animal industry; and A. J. Norman, a graduate of the Iowa College, as assistant in horticulture.

Arizona University and Station.—R. W. Clothier, of the Florida University, has accepted an appointment as professor of agriculture to include the farmers' institute work. E. E. Free, assistant chemist in the station, has resigned to accept an appointment in the Bureau of Soils of this Department and is succeeded by Dr. W. H. Ross, of the University of Chicago.

California Station.—E. J. Wickson, who has been acting director for some time, has been chosen director.

Colorado College.—Two-year practical courses in agriculture, domestic science, and horseshoeing are announced in a recent bulletin. These courses are to open November 5 and continue for five months during the winter, when there is no rush of work on the farm.

Connecticut State Station.—E. J. Shanley, assistant chemist, has resigned to accept a position as food chemist in the Bureau of Chemistry of this Department.

Connecticut Storrs College and Station.—The college has received a State appropriation of $50,000 for new greenhouses and a horticultural building. The old greenhouse has been turned over to the station and will be a valuable addition to its equipment.

Florida Station.—An irrigation plant is to be constructed in connection with the horticultural work at a cost of $1,000. H. P. Stuckey has resigned as assistant in agronomy. B. F. Floyd, assistant in botany in the Missouri University and Station, has accepted a position in plant physiology and will devote his time to the study of plant nutrition.

Illinois Station.—C. H. Myers has been appointed assistant in chemistry and plant breeding.

Iowa College.—A. V. Storms, R. E. Drennen, Edith G. Charlton, J. A. King, and W. R. Scott have been added to the extension department of the college.

Kansas College and Station.—A department of bacteriology has been established in charge of W. E. King. H. D. Scudder, assistant in agronomy in the college, has resigned to become professor of agronomy in the Oregon College. In accordance with an act of the legislature at its last session, Director C. W. Burkett has made an extended trip to the wheat-growing regions of Europe with a view to the importation of valuable varieties and their distribution through the agency of the station. Oscar Erf, professor of dairy husbandry, is also in Europe studying the dairy industry. E. A. Popenoe has resigned as professor of entomology and zoology in the college and entomologist in the station, and, as previously noted, has been succeeded by T. J. Headlee, of the New Hampshire College and Station. Arthur L. Peck, a graduate of the Massachusetts College, has been appointed assistant horticulturist in the college and station. He will have charge of the experimental work on vegetables.

Louisiana Stations.—H. R. Fulton, plant pathologist, has resigned to accept a similar position at Pennsylvania State College.

Maine University and Station.—W. D. Hurd, acting dean for the past year, has been made dean of the College of Agriculture. G. M. Gowell, for many years professor of animal industry in the college, will henceforth devote his entire time to the poultry investigations of the station, and is succeeded in the college by P. A. Campbell, now instructor in animal husbandry. Herman Beckenstrater, a graduate of the Wisconsin University, has been elected assistant professor of horticulture, and J. E. McClintock, for the past two years an assistant in the Bureau of Soils of this Department, has been elected supervisor of extension work. A farm cottage, a piggery, and a building for the storage of farm implements are being constructed.

Massachusetts College.—F. S. Cooley has resigned as assistant professor of agriculture to accept the newly created position of supervisor of farmers' institutes in Montana.

Michigan College and Station.—E. E. Bogue, head of the department of forestry in the college, died August 19 at the age of 43 years. Z. P. Metcalf has been appointed assistant in entomology in the college and assistant entomologist in the station.

Minnesota Station.—A department of animal nutrition has been established, in charge of T. L. Haecker as professor of dairy husbandry and of animal nutrition.

Montana College and Station.—V. K. Chestnut, professor of chemistry in the college and chemist in the station, resigned September 1 to accept a position with the Bureau of Chemistry of this Department. He is succeeded in the college by W. M. Cobleigh, the professor of physics, and in the station by Edmund Burke, the assistant chemist. A course in pharmacy is to be established.

New Hampshire Station.—C. S. Spooner, of the Bureau of Entomology of this Department, has been appointed assistant entomologist.

New Jersey Stations.—James W. Kellogg, assistant chemist, has resigned to accept a position in the Pennsylvania department of agriculture in connection with the inspection of feeding stuffs.

New Mexico Station.—A novel attempt is being made to combat the codling moth in Donna Ana County by eliminating its food supply. The conditions this season have been unusually favorable for the experiment, as a severe freeze in April killed practically all the fruit in the county. All the orchards were then given a thorough inspection and any fruit found on the trees was destroyed, thereby effecting, it is hoped, the starvation of the entire second brood. To prevent the reintroduction of the pest, all fruit shipped into the county from other sections is being inspected and destroyed if found wormy.

New York State Station.—W. G. Johnson, of *American Agriculturist*, has been appointed by Governor Hughes a member of the board of control to succeed M. H. Olin, deceased.

North Carolina College.—John Michels, of the South Carolina College and Station, has been appointed associate professor of animal husbandry and dairying, and T. D. Eason, a graduate of that college, has been appointed assistant in botany.

North Dakota College and Station.—F. J. Pritchard, assistant professor of botany in the college and assistant botanist in the station, has resigned, to take up advanced work in plant breeding at Cornell University, and is succeeded by F. J. Seaver, late a fellowship student at Columbia University. T. D. Beckwith, of the Soil Bacteriology and Water Purification Investigations of this Department, has been elected assistant professor of bacteriology and plant pathology, and will be associated with the botanist in special soil investigations at the station.

Ohio University and Station.—The Percheron Horse Society of France has recently presented the university with a bronze figure of a percheron to be used in the annual competition of the department of animal husbandry. The figure will at all times be on exhibition to the visiting public, but each year the student having the highest rank in horse judging is to be regarded as its temporary winner and will have his name inscribed upon it. The figure has a total height of 25 inches and is said to be an especially fine work of art.

C. W. Gay has resigned as associate professor of animal husbandry to accept the newly established professorship of animal husbandry in the Veterinary College of the University of Pennsylvania, and has been succeeded by F. R. Marshall, of the Texas College and Station, who will have the title of professor of animal husbandry. R. H. Williams, a graduate of the Ontario Agricultural College, and who received the degree of M. S. at the Illinois University last June, has been appointed assistant in animal husbandry. J. A. Foord, associate professor of crop production and improvement, has resigned, to accept a similar position at the Massachusetts College.

C. W. Montgomery, of Newark, has been appointed a member of the board of control of the station, vice Alva Agee.

Oklahoma College.—A teachers' correspondence course in agriculture has been established, covering two years of nine months each, the work taken up being essentially that given in the School of Agriculture and Domestic Economy, except as to the practical phases. It is hoped that this course will enable teachers to introduce agriculture into their schools in the near future, as well as to fit them for examination in this subject when this is required, as provided for in the pending constitution.

Oregon College and Station.—C. C. Vincent has been appointed assistant in horticulture in the station. F. E. Edwards, assistant professor of chemistry in the college and assistant chemist in the station, has resigned to accept a position with the California Polytechnic School. C. C. Clark has been appointed horticulturist of the Eastern Oregon Substation at Union.

Pennsylvania College and Station.—G. C. Watson, agriculturist, has been granted a furlough of one year, and is acting as manager of a series of farms near Syracuse. C. L. Penny, of the Delaware Station, has been appointed professor of agricultural chemistry in the college.

Porto Rico Station.—P. L. Gile, of the Missouri Station, has been appointed assistant chemist and has entered upon his duties.

Rhode Island Station.—W. F. Schoppe, a graduate of the University of Maine, has been appointed general assistant, and will take charge of the details of the experiments in poultry feeding. The station is carrying on a number of cooperative field experiments in different parts of the State. These are conducted primarily for the purpose of securing material for use in scientific researches now in progress, but they serve incidentally as an aid to the study of the immediate soil requirements in the respective localities.

Clemson College and Station.—H. W. Barre, a graduate of the college, and a recent recipient of the degree of M. S. from the University of Nebraska, has been elected botanist. C. E. Chambliss, entomologist, has resigned. D. O. Nourse, for several years connected with the Virginia College and Station, has been elected professor of agriculture.

Tennessee Station.—J. E. Hite, J. E. Converse, and W. N. Rudd have been appointed assistants in cooperative experiments at Gallatin, Cookeville, and McMinnville, respectively.

Texas Station.—At the last meeting of the board of control the president of the college, H. H. Harrington, was made director of the station, with J. W. Carson assistant to the director and in charge of the feed control work. W. C. Welborn was elected vice director and agriculturist. J. C. Burns, formerly assistant in animal husbandry in the college and station, was made acting professor and placed in control of the station work in animal husbandry, vice F. R. Marshall, who, as noted elsewhere, has gone to Ohio State University.

Utah College and Station.—Dr. A. S. Condon, of Ogden, and J. W. N. Whitecotton, of Provo, have been appointed to the board of trustees, of which L. N. Stohl has been elected president. A college course in veterinary science is to be offered for the first time. The work in agriculture has been increased and the course divided, degrees now being offered in agronomy and arid farming, horticulture and entomology, irrigation and drainage, and animal industry and dairying. A cooperative arrangement has been entered into with the University of Utah whereby a course in irrigation engineering will be offered jointly by the two institutions. The practical and agricultural work will be given by the college and the technical engineering subjects by the university. A normal course in agriculture and domestic science is to be established in a similar manner.

In the station, Robert Stewart has been advanced from assistant chemist to chemist. J. C. Hogenson has been appointed agronomist and E. G. Titus, of the Bureau of Entomology of this Department, associate entomologist. James Dryden, poultryman, has resigned to accept a position with the Oregon Station, and G. M. Turpin, who has been associated with him, will continue the experiments as assistant poultryman. C. Larsen, dairyman, has accepted a position with the South Dakota College.

Virginia College and Station.—A. P. Spencer, a graduate of the college and formerly connected with the station, has been appointed assistant in animal husbandry. T. L. Watson has resigned as consulting geologist.

Washington Station.—According to a note in *Northwestern Horticulturist*, R. S. Northrop, of the Utah College and Station, has been appointed superintendent of the Puyallup substation. This substation has been closed since 1903, but, as previously noted, was reestablished by the last legislature.

Wyoming University and Station.—L. B. McWethy, instructor in agronomy at the Michigan College, has been appointed agronomist in the station and will also teach agronomy in the university. T. F. McConnell has been appointed experimenter in live stock and instructor in animal husbandry in the university.

National Irrigation Congress.—The fifteenth annual session of the National Irrigation Congress was held in Sacramento, Cal., September 2–7, with over 4,000 delegates and visitors in attendance. Vice-President Fairbanks, Senators Perkins, of California, and Newlands, of Nevada, the governors of six States, representatives from China, Germany, and Mexico, E. H. Harriman, and Luther Burbank were among the speakers. The general topic for discussion was the conservation of the national resources. Most of the Federal bureaus engaged in such work were represented and presented outlines of their respective duties.

An address by Gifford Pinchot, of the Forest Service of this Department, dealt especially with the timber supply, and gave estimates showing the probable exhaustion of the present stumpage in thirty-three years. The conservation of soils was discussed by W J McGee, of the Bureau of Soils, that of the mineral resources by J. A. Holmes, of the Geological Survey, and that of the water resources by M. O. Leighton, of the Geological Survey.

F. H. Newell, Director of the Reclamation Service, summarized the work of that service, stating that the expenditures to date had been $33,000,000. The amount available for the next year would be about $7,000,000, which would exhaust the accumulated fund. From that time the service must depend on its current income. Few of the larger projects are completed, and the plan is to get a portion of the land under each reclaimed as soon as possible, and then, with the revenue derived from this part, to build the remainder of the works and finish the reclamation of the entire area.

The work of this Office in irrigation and drainage was outlined in a paper by A. C. True, who was unable to be present. The irrigation work was explained as dealing with the use of water, rather than the construction of works to supply water, and as including the study of the best methods of irrigation throughout the arid region, the feasibility of irrigation in connection with the farming of the semiarid plains, and the profitableness of irrigation in the humid East, where truck and fruit crops of high value are often injured by droughts of short duration. The drainage work consists in formulating and demonstrating the best methods of removing surplus water and protecting land from overflow. Plans for the improvement of more than 2,000,000 acres were made during the past year.

Elwood Mead discussed the necessity for laws providing for definite titles to water rights, in order that the canal owner may have the same security as the landowner; and F. W. Roeding gave an account of the irrigation extension work on the semiarid plains in connection with the three demonstration farms established by the Office.

S. Fortier declared the greatest need of the arid region to be industrious white settlers. He showed that during the year 1908 5,000,000 acres of unimproved lands provided with water rights will be opened for settlement, besides those in Colorado, Montana, Kansas, Nebraska, Oklahoma, and Texas. Before any harvest can be obtained on this new land an average of $20 per acre, or $100,000,000, must be expended. Most of the settlers for this land must come from regions where irrigation is not practiced, and this large expenditure is likely to be lost unless it can be wisely directed. To meet this demand, Professor Fortier recommended the employment by the Government of sufficient skilled irrigation farmers to direct the work of the new settlers.

Among the resolutions adopted by the congress were a recommendation for the reorganization of the irrigation and drainage investigations of this Office as a separate bureau, in recognition of its importance, and an indorsement of the work of the Bureau of Soils, the Forest Service, and the Reclamation Service.

American Chemical Society.—The thirty-sixth general meeting of this organization was held at Toronto June 27–29, with about 150 delegates and visitors in attendance. During the session an excursion was made to the Ontario Agricultural College and Experimental Farm at Guelph. Among the addresses delivered before the general assembly was one on Chemistry and Canadian Agriculture, by F. T. Shutt, chairman of the section on agricultural, sanitary, and biological chemistry. Papers were presented to this section on Unification of Terms Used in Reporting Analytical Results, by C. G. Hopkins; The Determination of Boric Acid in Common Salt, by W. D. Bigelow and C. S. Brinton; and Solubilities of Food Colors, by E. Gudeman, together with several reported by title only. It was decided to separate the offices of editor and secretary, Prof. W. A. Noyes, now of the University of Illinois, retaining the editorship of the *Journal of the American Chemical Society* and of *Chemical Abstracts*, and Dr. C. L. Parsons, head of the chemical department of the New Hampshire College, becoming secretary.

International Zoological Congress.—The Seventh International Zoological Congress was held in Boston August 19–25, in the new buildings of the Harvard Medical School. Alexander Agassiz presided, and general addresses were delivered by Prof. R. Hertwig, of Munich, on *Neuere Probleme der Zellforschung*, Sir John Murray, of the Challenger Expedition, and Prof. W. K. Brooks, of Johns Hopkins University, on Are Heredity and Variation Facts? Nearly 300 papers and addresses were offered in the various sections. Following the scientific session excursions were conducted during the following two weeks to various scientific and educational institutions in Boston, New York, Philadelphia, Washington, and other points of interest.

International Institute of Agriculture.—According to a recent note in *Science*, forty-four nations, including nearly all of agricultural importance, have now ratified the convention for the creation of this institution. The palace which is being erected for the Institute in the gardens of the Villa Borghese in Rome is rapidly approaching completion. Invitations for the meeting of the permanent committee in charge and for the inauguration of the Institute will probably be issued in November, and with the first meeting of the committee next spring the Institute will enter upon active work.

In the meantime, the Italian Royal Commission has appointed Professor Pantaleoni to superintend an inquiry as to the exact extent of the information which the different countries which have adhered to the convention can supply with regard to their agricultural production. This information will be catalogued and classified in tabular form, and a report, which will also contain comments on the various statistical methods employed, will be ready for the use of the permanent committee, whose first duty will be to discover the amount and reliable character of the statistics already available and to suggest new means of obtaining information where necessary. A great mass of material bearing on this subject has already been received by the *Consulta* from the countries interested.

The Royal Commission has also intrusted Professor Bodio, of the General Bureau of Statistics, with a mission to Germany and Austria in order to study on the spot the systems pursued by those countries for the collection of agricultural reports, and has taken other steps as well in order to extend and improve the statistics furnished in Italy.

New journals.—A Russian journal, entitled *Zhurnal Bolyeznī Rastenii*, has been begun under the editorship of A. A. Elenkin, assisted by a corps of collaborators. It is to be the official organ of the central station of plant pathology at the Imperial Botanical Gardens at St. Petersburg and will appear quarterly. German summaries of original contributions will be given. The first number contains articles on the occurrence of the mildew *Sphærotheca mors-uvæ* on the fruit of gooseberries, the Russian species of dodder, symbiosis, a mite disease of onions due to *Tyroglyphus allii* n. sp., a gall of Pyrethrum, and the first portion of a monograph on the edible and poisonous mushrooms of Russia.

According to *Gardener's Chronicle*, *Finske Tradgardsolare*, a horticultural journal in the Swedish language, has recently been established at Helsingfors, Finland, by a local nurseryman.

Miscellaneous.—The new barns of the Macdonald Agricultural College were struck by lightning September 5 and totally destroyed. The loss is said to be about $50,000.

The Secondary and Agricultural School at Bigods Hall, Dunmow, establisned by Lady Warwick about ten years ago, is to be closed. A lack of cordial support from the local educational committee and the resignation of the head master are among the reasons assigned.

Prof. W. O. Atwater died at Middletown, Conn., September 22, after several years of failing health. An account of his life will be given in the next issue.

Dr. C. A. Browne, jr., in charge of the sugar laboratory in the Bureau of Chemistry, of this Department, has resigned to become chief of the New York

Sugar Trade Laboratory, just established. He will assume his new duties about the middle of October.

C. C. Poindexter, a graduate of Ohio State University, and more recently private secretary to Prof. T. F. Hunt at Cornell University, has been appointed Director of the Department of Agriculture of the American Church Institute for Negroes. He will endeavor to introduce the study of agriculture into the St. Paul Normal and Industrial School, Lawrenceville, Va., and into the St. Augustine School, Raleigh, N. C., and will also give lectures on agricultural economics and rural sociology to the students in the Bishop Payne Divinity School, Petersburg, Va.

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EXPERIMENT STATION RECORD.

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Professor Wilbur Olin Atwater, of Connecticut, whose death, September 22, 1907, terminated an illness of nearly three years, was for many years a leader in the experiment station movement in the United States. He was born at Johnsburg, New York, May 3, 1844, and received his academic training at the University of Vermont and Wesleyan University, Middletown, Conn., graduating from the latter institution in 1865. He received the degree of doctor of philosophy from Yale University in 1869, after a period principally spent in studying agricultural chemistry under Professor S. W. Johnson. There he also came under the influence of Professor W. H. Brewer. At this time he showed the desire to work in fields of science giving promise of early enlargement, and the ability to forecast correctly the lines of development—characteristics which largely determined his future success.

As part of his work for his doctor's degree he made a considerable number of analyses of several varieties of Indian corn—the first work of the kind done with modern methods on this side of the Atlantic.

From 1869 to 1871 he studied agricultural and physiological chemistry at the Universities of Leipsic and Berlin, and acquainted himself with the European agricultural experiment stations. After his return to America his first experience as a college professor was at the University of Tennessee and the Maine State College. He was thus brought into close touch with the national movement for agricultural education and research.

Coming to Wesleyan University in 1873 as professor of chemistry he was again brought into close association with Professors Johnson and Brewer at New Haven, and with other agricultural leaders in Connecticut. He also became intimate with Orange Judd, the founder and long-time editor of the *American Agriculturist*, who had but recently given to Wesleyan, his alma mater, a hall of natural sciences, in which Professor Atwater had his laboratory for more than thirty years.

With these men as associates and advisers, Professor Atwater, fresh from his observations of the agricultural experiment stations in Europe, entered with enthusiasm into the movement already on foot to establish similar institutions in the United States. On December 17, 1873, at the winter meeting of the Connecticut State Board of Agriculture, Professors Johnson and Atwater urged the establishment of a station in Connecticut after the European pattern. A long period of agitation followed. The project had many warm friends, but the great mass of the farmers took little interest in the enterprise. When it became apparent that it could not otherwise succeed, Mr. Judd offered on his own part $1,000 to begin the undertaking, and on the part of the trustees of Wesleyan University the free use of a chemical laboratory. These offers were made on condition that the State legislature should appropriate $2,000 per annum for two years for the work of the station. An act making this appropriation was unanimously passed July 2, 1875. Professor Atwater was made director and the first State agricultural experiment station began operations in October of that year. At the end of the two years provided for in the original bill the station was reorganized under the direct control of the State and permanently located in New Haven.

Without doubt this action of the State was a great discouragement to Professor Atwater, but with his usual persistency he continued to labor earnestly in the cause of agricultural science. He organized and superintended an extensive series of field experiments with fertilizers, accounts of which were printed in the annual reports of the Connecticut State Board of Agriculture for 1877 and succeeding years. He also prepared a series of about seventy articles on science applied to farming, which were published in the *American Agriculturist* from 1875 to 1881.

As agricultural experiment stations were established one after another in rapid succession in different States he kept in touch with the leaders in this movement, and when it assumed a national aspect and Congress was asked to enact a general law granting funds for stations in all the States he was among the foremost of the representative leaders of agricultural advancement who urged the adoption of this measure.

The report made in 1887 by a committee of the Association of American Agricultural Colleges and Experiment Stations, of which Professor Atwater was chairman, is notable as showing his attitude regarding the character of the work the stations should undertake:

"It is essential that they recognize the immediate demand for things immediately useful; that they find what questions are of direct practical importance and give such questions an amount of early attention which under other circumstances might be disproportionate. But it is vitally important that the highest scientific ideal be maintained and every effort be made toward its realization.

The future usefulness of the stations will depend upon what they discover of permanent value, and this must come largely from the most abstract and profound research; to forget this will be fatal."

On the passage of the Hatch Act in 1887, granting $15,000 annually to each State and Territory for the maintenance of one or more experiment stations, the Storrs Agricultural Experiment Station was organized by an act of the Connecticut legislature and half the income received under the Hatch Act was granted to this station. Professor Atwater was made director and for fourteen years managed this station. During this period a relatively large amount of scientific work along chemical and other lines related to agriculture was done by the station with quite limited funds. Of special interest were his studies on the acquisition of atmospheric nitrogen by plants, begun several years prior to the establishment of the Storrs Station and continued as part of the work of that station from 1888 to 1892.

On the invitation of Commissioner Colman Professor Atwater consented to become the first director of the Office of Experiment Stations, on condition that he should retain the directorship of the Storrs Station and his college professorship. In this capacity, Professor Atwater established in large measure the policy on which the Office has since been conducted and laid down the lines of its future work.

In his first report the following statements were made regarding the functions he deemed proper for this Office:

"The most immediately pressing need seems to be that of a clearing house and an exchange for the stations. The stations are widely separated; they need to know more about each other's work; they need each other's help, especially that which comes from the interchange of experience. Much is gained by the proper distribution of work and by cooperation where that is feasible. As a clearing house this Office can facilitate intercommunication between the stations, collate the results of their work, and facilitate its most advantageous coordination. It can serve as an exchange or distributing point for information in two ways, negotiating between the stations and the agricultural public, on the one side, and between the stations and the world of science, on the other.

"One of the means by which this Department can mediate between the stations and the agricultural public is the issuing of a series of farmers' bulletins, which should collate the results of station work bearing upon special topics, and the teachings of other research, and put the whole into a form so plain that the intelligent farmer will understand it, so brief that he will read it through, and so practical that he will take it to heart. Thus, while each station is distributing its own results to the farmer of its own State, this instrumentality will help to make the several stations serviceable to the agriculture of the whole country.

"As a mediator between the stations and the world of science this branch of the Department should be in a condition to collate the results of experimental research in this country and in Europe, and publish them in convenient form for the use of the station workers and others interested in the science of agriculture.

"One need is a journal for the stations, to contain accounts of their current research, abstracts of similar work in this and in other countries, and other matters of mutual interest.

"Information is also greatly needed in regard to past work and its results. This would be probably best brought to the stations in the form of monographs on special subjects."

The first Farmers' Bulletin was published in 1889. This series proved so popular that it was soon transferred from the Office and made a general series for the Department of Agriculture. Congress made a special printing fund for these bulletins and the Congressmen undertook their distribution on a large scale. Some three hundred of these bulletins have been issued, a large number of which were prepared in the Office of Experiment Stations. The editions of many have aggregated hundreds of thousands of copies, and the total output of Farmers' Bulletins by the Department has been many millions of copies. In 1906 alone more than 7,500,000 copies were printed.

The abstract journal was provided in the *Experiment Station Record*, the first volume of which appeared in 1889. This has been developed into the most comprehensive journal of its class in existence, and its circulation among students and investigators in agricultural science is world-wide. The Office has also published a considerable number of monographs on special subjects, as suggested by Professor Atwater.

With the rapid growth of the experiment station movement at home and abroad and the recognized success of the Office as a promoter of the stations' interests, the business of this Office soon increased to such an extent that it became obvious that it should have at its head a Chief who could devote his entire time to its management. Unwilling to relinquish his work as a teacher and investigator, Professor Atwater decided to give up the directorship of the Office in 1891. He continued, however, to have official relations with the Office to the end of his active career.

The influence of Professor Atwater on the development of agricultural education and research in this country has been greatly broadened through the men who came into direct association with him as students in his laboratory and who have since become directors of experiment stations and professors in the agricultural colleges.

Some of these men are now among the most active and influential leaders in this national movement.

Parallel with his studies in agricultural chemistry, Professor Atwater began at an early day to carry on investigations in physiological chemistry, with special reference to the problems of human nutrition. These studies soon brought him into official relations with national and State organizations having funds which could be used to promote research in these lines. Between 1879 and 1883 he made a series of analyses of fish for the U. S. Fish Commission and of the flesh of domestic animals for the Smithsonian Institution. Studies of the dietaries of people in Massachusetts and Canada were also made for the Massachusetts Bureau of Statistics and Labor and published in 1886.

Similar work was instituted in connection with the Storrs Experiment Station, and in 1893 with the aid of Hon. J. Sterling Morton, then Secretary of Agriculture, an appropriation was obtained from Congress for investigations in human nutrition in cooperation with the experiment stations. Headquarters for this enterprise were established at Middletown, Conn., and Professor Atwater was made its official chief. This work was broadly planned and steadily developed in succeeding years, until it became the most comprehensive investigation on this subject ever undertaken. The cooperation of universities, colleges, and schools, experiment stations, public institutions, and private organizations of various kinds was secured in different parts of the country. Hundreds of dietary studies of people of different occupations were made and the results of similar studies throughout the world were collated. Numerous digestion experiments with men were carried on and special studies made of the nutritive value of different cereals, meats, vegetables, fruits, and nuts, the effects of cooking and other forms of preparation on nutritive value, and other important food problems. Special efforts were made to improve methods and apparatus for such work.

From a scientific point of view, the most important result of these investigations was the development and use by Professor Atwater and his associates of special forms of bomb and respiration calorimeters. An instrument was thus provided for studying the effect of food in the development of energy, which surpasses all apparatus of the kind in range and accuracy of operation. As a direct outcome of this work, a respiration calorimeter for use with the larger domestic animals has been constructed by Doctor Armsby at State College, Pa. The studies in human nutrition already made with the Atwater-Rosa-Benedict calorimeter have been very important and promise to be still more so. Direct evidence has been obtained that the law of the conservation of energy holds good in the utilization of food in the human body, as well as important data regarding the actual nutritive value of different foods and the relations of food to muscular energy and mental work.

As the Chief of Nutrition Investigations in the Office of Experiment Stations, Professor Atwater planned and supervised investigations which were carried on in about twenty States. The results of this work are embodied in about one hundred technical and popular publications issued by this Department and the Storrs Experiment Station.

These publications have had a wide distribution and have been extensively utilized in domestic science courses in colleges and schools throughout the country and in the preparation of text-books and manuals on human nutrition in this and other countries.

In the judgment of competent experts, the nutrition investigations conducted under Professor Atwater's direction were more thorough in their scientific methods, more extended in the scope and amount of investigation, and more useful in the distribution and practical application of their results than any other inquiry of the kind ever undertaken in this country or in Europe.

As a public official working in a wide way in the organization and management of enterprises for the general good, Professor Atwater has earned the lasting gratitude of his countrymen, especially by what he did in connection with the agricultural experiment stations and the nutrition investigations. To this work he brought a well-trained mind and a true scientific purpose. He had the enthusiasm and persistence necessary to impress other men with the importance of his enterprises and to carry him successfully over periods of opposition and discouragement. He had unusual ability in the conception and formulation of broad lines of work, and in attracting and holding men competent to give him such aid as he needed to complete these plans, put them into successful operation, and secure substantial results.

The observance by the Massachusetts Agricultural College of its fortieth anniversary by means of a four-day conference on rural progress was a novel and suggestive departure of considerable general interest. While, as may be seen by reference to the program as given elsewhere in this issue, the historical and anniversary aspects of the occasion received substantial recognition, the opportunity was utilized in the main as a means of bringing together the varied forces making for rural betterment—educational, social, and religious, as well as those distinctively agricultural. The cooperation of existing organizations such as the State Board of Agriculture, the State Grange, and local associations of workers in schools, churches, and libraries was invited, and the program was so arranged as to offer not only sessions at which the special phases of immediate interest to each of these bodies could be considered, but also an opportunity for all to come in touch with questions of general significance.

Although the attendance at some of the sessions was less representative than had been expected, much interest was developed, especially among people but indirectly associated with agriculture and to whom the agricultural college had hitherto apparently seemed to make little appeal. The conference attracted an amount of attention from the daily press of New England seldom accorded to agricultural meetings, and in many journals the sessions were reported in considerable detail. At the close of the meetings the *Springfield Republican* commented editorially as follows:

"To estimate the actual and potential benefits of the conference is impossible, for its coherent variety might appeal to a breadth of interests which can not be mapped or platted and the wholesome strength of the influences may give them life extending beyond our perspective and branching out where we do not see. The idea of a conference on rural progress was a happy conception which was well carried out. It furnished an excellent precedent well worth following."

The need of a conference of this sort may be attributed in part to an increasing realization of the complexity of the problems confronting rural progress and the desirability of thorough understanding and sympathetic cooperation on the part of the various agencies engaged in their solution, and in part to a broader conception of the responsibility of the agricultural colleges and experiment stations in all that pertains to rural welfare. It indicates a belief that these institutions are to be looked to not only for advice in the growing of crops and the raising of stock, but also for leadership in matters connected with the farmer's roads, his school, and his home—in short, that they are potential agencies of education to an extent as yet realized only in part by the community and perhaps not fully by the institutions themselves.

Something as to the part which the experiment stations may take in such advancement was developed in the address of Doctor True on The Broad Outlook of the Agricultural Experiment Stations, which he declared to be along educational lines and for the benefit of the village and urban residents as well as the farmers.

"With their existing financial limitations the stations have properly given their attention thus far principally to the needs of our large agricultural industries, but they have also done much which is of use to village and city people, and they will undoubtedly enlarge their work in this direction as time goes on and funds increase. The farmers need have no fear that the stations will forget them or neglect their interests, but should rather rejoice that in the stations they have a powerful agency for bringing city people into closer sympathy with rural people."

"Already," he went on to say, "the work of the stations has created an entirely new agricultural literature, and . . . laid the foundations for a sound agricultural pedagogy, and . . . they must ever supply the new materials by which the courses can be strengthened and improved. But their work has a far more fundamental and far-reaching purpose; namely, to make agriculture a progressive industry and the masses of agricultural workers progressive men. Many plans for rural improvement have been made by philanthropists and statesmen, but they have largely been failures because they were imposed on the unwilling minds and hearts of unprogressive people. But if the rural people themselves awake and make their plans of improvement we may surely expect wonderful things. As an arouser of desire for improvement and a stimulator to intelligent effort to make the country a better place to live and work in, the agricultural experiment station has its chief importance and its highest mission. And it is for this service that the stations especially commend themselves to all the friends of rural progress, for if these fountains of new knowledge are kept strong and pure their waters will spring up forever to replenish the life of countless generations of rural people."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Nitron as a microchemical reagent, H. L. Visser (*Chem. Weekblad, 3 (1906), pp. 743–746; abs. in Chem. Zentbl., 1907, I, No. 4, p. 302; Jour. Soc. Chem. Indus., 26 (1907), No. 4, pp. 167, 168; Jour. Chem. Soc. [London], 92 (1907), No. 535, II, p. 394*).—The author recommends that instead of weighing the nitron nitrate in determining nitric acid the determination be made by comparing the depth of the layer of precipitate with that of a corresponding precipitate from a solution of known content of nitric acid in glass tubes of equal diameter.

It is stated that nitron also forms almost insoluble salts with nitrous, chloric, perchloric, oxalic, and salicylic acids, which may be distinguished under the microscope by differences of crystalline form. "Nitron may also be used for the microchemical detection of saccharin if the latter be first converted into *o*-sulphaminobenzoic acid by the action of dilute alkali." The characteristic crystalline form of this substance is easily detected with the microscope.

Note on the determination of nitrogen by the Jodlbaur method, H. Volkholz (*Chem. Ztg., 30 (1906), p. 370; abs. in Ztschr. Angew. Chem., 20 (1907), No. 23, pp. 960, 961*).—The author simplifies and shortens this method by adding the zinc dust in small portions and with vigorous shaking to the hot acid solution.

Determination of nitrous acid and its separation from nitric acid, G. Maderna and G. Coffetti (*Abs. in Chem. Ztg., 31 (1907), No. 29, p. 375; Analyst, 32 (1907), No. 375, p. 234*).—The method proposed is based upon the fact that in the presence of acetic acid, or, preferably, citric acid, nitrous acid is reduced to nitric oxid by ferrocyanids, and the liberated gas may be collected and measured. Under these conditions nitric acid does not react with ferrocyanid.

Detection of nitric and nitrous acids, H. W. Wagner (*Pharm. Centralhalle, 48 (1907), pp. 5–7; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 533, II, p. 196*).—A slight modification of Sprengler's phenol test is recommended.

On the method of separating potassium from sodium as chloroplatinates, J. Morozewicz (*Bul. Acad. Sci. Cracovie, 1906, pp. 796–803; abs. in Chem. Abs., 1 (1907), No. 8, p. 972*).—Eighty per cent alcohol is considered preferable to absolute alcohol for washing out the sodium chloroplatinate. The polarizing microscope will detect doubly refracting salts in a drop of the slowly evaporated aqueous solution of the potassium chloroplatinate and thus determine its purity.

The estimation of free acids in superphosphates, J. Van Dormael (*Bul. Soc. Chim. Belg., 21 (1907), No. 3, pp. 103–115; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 8, p. 424; Analyst, 32 (1907), No. 374, p. 182*).—The method proposed embodies those of Herzfelder and Thomson and is based upon double titration with fourth-normal sodium hydroxid solution of the ether or alcohol extract (evaporated to dryness and taken up in water) of the dried superphosphates, titrating first with methyl orange and then with phenolphthalein. It is stated that as a rule the amount of free sulphuric acid in superphosphates is negligible, and therefore the whole of the sodium hydroxid consumed may be regarded as neutralizing only free phosphoric acid.

A short scheme of water analysis, J. A. HUGHES (*Merck's Rpt., 16 (1907), No. 5, pp. 128, 129*).—A simple scheme, which is considered sufficient to enable one to quickly form a very good opinion of the potability of a given water, is described.

Chemical soil analysis for investigations in plant physiology, E. A. MITSCHERLICH (*Landw. Jahrb., 36 (1907), No. 2, pp. 309–369, pl. 1, figs. 10*).—The method proposed by the author (see also E. S. R., 18, p. 417), is based upon the assumption that solubility in water saturated with carbon dioxid is a measure of the plant food in the soil at the disposal of cultivated plants. Studies of the influence of the elements of time, carbon dioxid content of the solvent, amount of solvent, and temperature are reported and the details of the method recommended are given.

The extract is prepared by digestion of the soil with 10 or 25 times its amount of solvent for 1½ hours at 30° C. in a flask provided with a constant stirring apparatus and connected with a cylinder of compressed carbon dioxid which keeps the solution in the flask saturated with carbon dioxid. The extract is clarified by suction through a clay filter and aliquot portions are taken for determination of nitrogen by the phenol-sulphuric acid method, potash by the ordinary procedure, final weighing being made of reduced platinum according to Regel (E. S. R., 18, p. 108), phosphoric acid by the Wagner-Stutzer molybdic method, and lime by precipitation with ammonium oxalate as usual.

The errors inherent in the various determinations are discussed and a series of tests are reported which show that the method is capable of detecting small variations in the composition of soils due to applications of fertilizers.

On the question of the method of determining nitric acid in soils (*Vyestnik Sakh. Prom., 1906, No. 44, p. 652; abs. in Centbl. Zuckerindus., 15 (1907), No. 34, pp. 923, 924*).—This is a brief note on work of Welbel, Frankfurt, and Duschetschkin on this subject, which led to the conclusion that the methods of determining nitric acid in soils in which the soil is digested with water for 48 hours give too low results, due to reduction of nitrates. Two hours' digestion is fully sufficient to extract the nitric acid of soils. If longer treatment is necessary, accurate results can be obtained by adding chloroform, thymol, or other substances which check the activity of the lower organisms that reduce nitrates.

Notes on the determination of nitric acid in chernozem soils, V. I. SAZANOV (*Zhur. Opuitn. Agron. (Russ. Jour. Expt. Landw.), 7 (1906), No. 4, pp. 381–387*).—The experiments of the author show that for the estimation of the nitrates it is necessary not to allow the soil to remain in contact with the water, in the extraction, any longer than is required for the settling of the greater part of the fine particles. Longer contact causes a rapid diminution of the nitrates. Chloroform prevents this decrease of the nitrates. In keeping soils, the amount of nitrates increases with the time if the soils are preserved in the humid state. Chloroform does not prevent this increase. A quick drying (in the sun) prevents change in the nitrate content.—P. FIREMAN.

A new calcimeter, T. BIÉLER-CHATELAN (*Chron. Agr. Vaud, 20 (1907), No. 6, pp. 114–120, fig. 1*).—A simple apparatus for the rapid determination of calcium carbonate in soils is described and its practical use explained.

The use of biological methods in the analysis of food stuffs, A. J. J. VANDEVELDE (*Biochem. Ztschr., 1 (1906), No. 1–2, pp. 1–7*).—From his investigations with plasmolyse and hemolyse, the author concludes that it is possible to judge of the properties of different substances by biological methods and has reported determinations of the coefficient of toxicity of alcohols, aldehydes, acids, essences, oils, and similar substances of interest from their relation to food materials.

Concerning methods for the analysis of flours, breads, bakers' goods, alimentary pastes and similar goods, spices, and condiments (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *6* (*1907*), *No. 4*, *pp. 405–416*).—The directions for analysis are in accordance with the French law of August 1, 1905.

Comparative methods of determining the dry matter in potatoes, A. J. Hansen (*Tidsskr. Landbr. Planteavl, 13* (*1906*), *pp. 316–338*).—The results of the investigation show that the dry matter in potatoes may be determined with as much accuracy by drying as in other root crops, and that a good sample is best obtained by dividing each tuber into 8 parts by 3 perpendicular cuts through its center and selecting one or more of these parts for comminution. The author finds that results obtained by calculation of dry substance from determinations of specific gravity according to Maercker's tables are 1 to 2 per cent too low.—F. W. WOLL.

The mono-amino acids of "syntonins" from beef, E. Abderhalden and T. Sasaki (*Ztschr. Physiol. Chem., 51* (*1907*), *No. 4–5, pp. 404–408*).—Glycocoll, alanin, valin, leucin, prolin, asparagin, glutamin, phenylalanin, and tyrosin were obtained from syntonin in addition to humin. The results are expressed quantitatively.

A rapid method for the determination of fat in grits, meal, rice, and cerealine, O. Schütte (*Pure Products, 3* (*1907*), *No. 6, pp. 287–291*).—The method outlined consists in shaking a sample vigorously for 15 minutes in petroleum ether, filtering after settling and determining the amount of fat in an aliquot portion by evaporation and drying to a constant weight. As shown by comparison the results are, in the author's opinion, satisfactory, though on an average of 23 analyses they were 0.03 per cent lower than those obtained by the Soxhlet method.

A method is also described for the use of raw cereal in which the finely ground substance is allowed to stand over night in petroleum ether, filtered, and the fat determined in an aliquot portion. As shown by 8 comparative tests, the results were on an average 0.02 per cent lower than by the Soxhlet method.

The estimation of the unsaponifiable constituents of fat, G. Meyer (*Chem. Ztg., 31* (*1907*), *No. 33*, *p. 423*).—A comparative study of methods.

Concerning nitrogen-free extract in oil cakes, P. Christensen (*Jour. Landw., 55* (*1907*), *No. 1–2, pp. 47–67*).—The experimental study of the composition of oil cake of different sorts led the author to conclude that the determination, in addition to protein and fat, of total carbohydrates, starch, etc., which have food value, is a much more satisfactory procedure for judging the value of these feeding stuffs than the usual proximate analysis which includes crude fiber and nitrogen-free extract by difference. The method of estimating the total carbohydrates which he outlines depends upon the inversion of starch by diastase and acid. Before inversion the material is heated with water in a closed flask for 20 hours at 100° C.

The sugar content of dried chips and sugar-beet chips, F. Strohmer and O. Fallada (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Indus. Österr.-Ungar., No. 185, pp. 18–21; sep. from Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 36* (*1907*), *No. 2*).—The study of methods, which the authors report, led to the deduction that digesting the sugar-beet chips in the usual way with hot water may give too high values for the sugar content.

A new decomposition product of gliadin, T. B. OSBORNE and S. H. CLAPP (*Amer. Jour. Physiol., 18 (1907), No. 2, pp. 123–128, figs. 2*).—From gliadin hydrolyzed by boiling for a considerable time with 25 per cent sulphuric acid, a crystalline substance of definite character was isolated, which on vigorous hydrolysis gave prolin and phenylalanin. It seems probable that this substance is a dipeptid. The yield was in the proportion of about 4 gm. from 1 kg. of gliadin.

The quantitative estimation of extractive and protein phosphorus, W. KOCH (*Jour. Biol. Chem., 3 (1907), No. 2, pp. 159–164*).—The method outlined is especially applicable to a study of brain tissue and similar materials and, according to the author, can be generally used in the study of normal and pathological material.

Determination of dry matter in milk, G. HINARD (*Bul. Soc. Chim. France, 4. ser., 1–2 (1907), No. 10, pp. 558, 559*).—In determining total solids in milk the author has endeavored to avoid by the use of formaldehyde the progressive changes which take place in the proteids during prolonged heating. The method as tried experimentally consisted in adding 3 drops of formalin to 10 cc. of milk, coagulating the milk by means of 5 or 6 drops of a 15 per cent solution of acetic acid, and evaporating at 95 to 100° C. Heating for 5 days made a difference of only 0.12 per cent in the weight of the dry matter.

A reaction of formaldehyde with naphthalene in the presence of sulphuric acid, H. DITZ (*Chem. Ztg., 31 (1907), No. 35, pp. 445–447*).—In the presence of naphthalene dissolved in sulphuric acid, formaldehyde in very small quantities is said to give a brown coloration and in large quantities a bright blue coloration. In applying this test to milk the casein is precipitated by dilute sulphuric acid and the naphthalene sulphuric acid reagent is added to a small quantity of the clear whey.

On the determination of water in butter, H. FABER (*Mælkeritid, 20 (1907), No. 11, pp. 199–211*).—Descriptions are given of the following methods of determining the water content of butter in creameries: Gravimetric chemical analysis, the Gray, the Gerber, and the Carroll method. The last method given, which was invented by Professor Carroll in Dublin, in the author's opinion, bids fair to prove the most satisfactory as a preliminary approximate test.—F. W. WOLL.

Note on the determination of volatile fatty acids in butters (Reichert number), L. DE KONINGH (*Chem. News, 95 (1907), No. 2477, p. 229*).—A modification of the Reichert method is suggested for use when the quantity of butter is small and an early analysis is required. The process is as follows:

"The butter is melted in a test tube placed in hot water, and 2.5 gm. of the clear fat are saponified with 12.5 cc. of normal alcoholic caustic potash in a flask fitted with a long vertical tube. When saponified 25 cc. of distilled water are added, and the whole evaporated in a basin to pasty consistency. The soap is dissolved in warm water, made up to exactly 60 cc., and placed in the distilling flask. Fifteen cc. of normal sulphuric acid are then added, also some fragments of clay pipe. The whole is then submitted to distillation and 50 cc. are collected. The distillate is filtered into a 300 cc. flat-bottomed Jena flask and titrated with N/10 sodium hydroxid, with phenolphthalein as indicator. The result may, however, be too high, as during the evaporation of the soap a not inconsiderable quantity of carbon dioxid may have been absorbed, and the N/10 soda used in the titration, unless freshly made, may have become somewhat carbonated. Therefore 0.5 cc. of N/10 hydrochloric acid is added and the carbon dioxid expelled by rapidly heating the liquid to boiling and then boiling gently for 3 minutes. The flask is now rapidly cooled and the titration continued; the liquid should, of course, be colorless. From the total number of cubic centimeters of N/10 soda used 0.5 cc. is then deducted."

The iodin number of olive oil and variations in this value in Tunitian oils, R. Marcille (*Ann. Chim. Analyt., 12 (1907), No. 5, pp. 188–191*).—According to the author's investigations, wide variations occur in the iodin number of Tunitian olive oils.

Glycerin in wine, D. A. Lojodice (*Rev. Vit., 28 (1907), No. 713, pp. 179–185*).—The author finds that the difference between the extract determined by evaporation in a water bath at 100° C. and by drying in a vacuum represents approximately the glycerin content of wine determined by direct methods.

Agricultural laws, E. F. Ladd (*North Dakota Sta. Spec. Bul. 5, pp. 12*).—This contains the text of the State laws relating to the sale of commercial feeding stuffs and stock foods, formaldehyde, Paris green, and commercial fertilizers.

Food and drug laws, E. F. Ladd (*North Dakota Sta. Spec. Bul. 6, pp. 20*).—This contains the State pure-food law and the pure-drug law as amended and reenacted, the paint law, abstracts from other State laws dealing with the adulteration of foods, dairy products, oils and paints, and rulings, interpretations, and suggestions for the guidance of interested parties.

A milk colorimeter, A. Bernstein (*Chem. Ztg., 31 (1907), No. 58, p. 727, fig. 1*).—The apparatus described is intended for determining approximately the fat content of skim milk. The sample to be tested is coagulated with acetic acid and the color or cloudiness of the fluid portion is compared with that of a standard solution which corresponds in appearance to whey having a fat content of 0.15 per cent. The apparatus consists of 2 glass tubes with a blue glass rod in the center of each and a white porcelain background.

Apparatus for the determination of water and fat in butter, F. T. Shutt (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 14, pp. 8, figs. 2*).—This bulletin gives the results of tests of 2 pieces of apparatus now on the market, one designed for determining the amount of fat in butter and the other the water content. Fairly accurate fat determinations were made, but the results with the hygrometer were rather unsatisfactory.

METEOROLOGY—WATER.

The importance of meteorological and weather forecasting for practical farmers, F. Krüger (*Fuhling's Landw. Ztg., 56 (1907), No. 11, pp. 369–386, figs. 3*).—This is a discussion of this subject with a view to facilitating the use of the reports of the German weather service by practical farmers.

Meteorology in the service of agriculture, J. Hudig (*Cultura, 19 (1907), No. 223, pp. 182–189*).

Variations of the meteorological elements of the soil, A. Baldit (*Rev. Auvergne, 23 (1906), No. 4, pp. 269–271*).—Observations with a thermometer, barometer, and hygrometer buried in the soil at a depth of 1.8 m. from June 23–30 are reported. The temperature registered by the buried thermometer was 5° to 6° lower than that of the air thermometer. The barometric pressure in the soil was about 3 mm. higher than that of the barometer in air. The humidity was much higher in the soil than in the air (35 m. above ground). The most important fact observed was that the atmospheric pressure was transmitted to the buried barometer without appreciable lag or diminution of amplitude.

Results of meteorological observations in Brunswick, 1878–1905, Döbr (*Beitr. Statis. Braunschweig, 1907, No. 20, pp. 1–38, map 1*).—Detailed summaries are given.

Meteorological observations by the Biological Agricultural Institute of Amani, German East Africa, V. Lommel (*Pflanzer, 3 (1907), No. 5–6, pp.*

77–82).—Monthly summaries of observations on temperature, precipitation, and humidity at this place during 1906 are given.

Meteorological observations in German East Africa, P. Heidke (*Mitt. Forsch. Reis. u. Gelehrten Deut. Schutzgeb., 19 (1906), No. 1, pp. 40–106*).—Observations at 22 stations during 1899–1902 are summarized.

Rainfall observations in German East Africa, C. Uhlig (*Mitt. Forsch. Reis. u. Gelehrten Deut. Schutzgeb., 18 (1905), p. 352; 19 (1906), Nos. 2, pp. 164–180; 3, pp. 274–290; 4, pp. 305–335*).—Observations at some 70 places during 6 years are summarized.

The Innsbruck good weather wind, A. Defant (*Separate from Ber. Naturw. Med. Ver. Innsbruck, 30 (1905–6), pp. 16, fig. 1*).

Official experiments on hail protection in Italy, Vidal (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 5, pp. 386–400, figs. 2*).—The author takes exceptions to the conclusion from the official tests at Castel-Franco, near Venice, that cannonading is useless as a means of dissipating hailstorms and states that the results obtained in France lead to the opposite conclusion.

A rain gage for agricultural purposes, Grohmann (*Illus. Landw. Ztg., 27 (1907), No. 49, p. 441, fig. 1*).—Simple and convenient forms of a rain gage with measuring apparatus are described.

The psycho-physical aspect of climate, with a theory concerning intensities of sensation, W. F. Tyler (*Jour. Trop. Med. and Hyg., 10 (1907), No. 8, pp. 130–149, figs. 26; rev. in Sci. Amer. Sup., 64 (1907), No. 1645, p. 19*).—The author describes a scheme for the utilization of certain psychical phenomena (personal sensations) as a means of synthesizing meteorological measurements recorded by physical apparatus and proposes certain sensation scales "for correlating these personal sensations with the instrumental meteorological measurements corresponding to them."

Denudation and rainfall, C. Kassner (*Mitt. Justus Perthes' Geogr. Anst., 53 (1907), No. 2, pp. 46, 47; abs. in Science, n. ser., 25 (1907), No. 649, pp. 909, 910*).—It is suggested that in regions of subdued mountain forms there is now probably less rainfall than before leveling, due to erosion, took place, and that the former rainfall distribution can be estimated upon the basis of the approximate land elevation before denudation took place.

A reviewer, M. S. W. Jefferson, of Kassner's article, however, suggests that in many cases denudation has been accompanied by a compensating regional uplift, so that there has probably been in such cases little change in rainfall.

The rainfall in the department of Puy-de-Dôme, J. R. Plumandon (*Rev. Auvergne, 23 (1906), No. 4, pp. 247–264, charts 2*).—The distribution of the rainfall of this region with reference to topography, elevation, etc., is discussed in some detail. It is shown that there is no invariable relation between rainfall and elevation, but in accounting for distribution of rainfall it is necessary to take account not only of the absolute and relative elevation of the region under consideration, but also of the topography of the surrounding country, the form of the average isobars, and the direction of the winds.

Change in the climate of Kansas, F. H. Snow (*Trans. Kans. Acad. Sci., 20 (1906), pt. 2, pp. 288–291; Quart. Rpt. Kansas Bd. Agr., 26 (1907), No. 101, pp. 438–440*).—Replying to a recent article by the Chief of the Weather Bureau of this Department (E. S. R., 18, p. 1109), the author quotes his own records at the University of Kansas, Lawrence, Kans., covering a period of 39 years (1868–1906), to show that there has been an increase of rainfall and humidity and a decrease in velocity of the wind.

The author concludes that his observations "indicate a gradual change in the climate at Lawrence, Kans. And as this locality presents a typical illustration of the climate conditions of eastern Kansas, it is safe to infer that the same changes are taking place over the entire region of which it forms a part. The rainfall and atmospheric humidity have increased and the wind velocity has decreased. The change in the rainfall and wind velocity has been in each case more than 10 per cent, while the increase in the atmospheric humidity has been more than 6 per cent."

The climatology of Kansas, T. B. JENNINGS (*Trans. Kans. Acad. Sci., 20 (1906), pt. 2, pp. 273–276*).—A brief review is given of the available historical records of floods and droughts.

Climate of different parts of the world, M. BUIJSMAN (*Cultura, 19 (1907), No. 224, pp. 277–279*).—This is a contribution to the climate of Cochin-China as indicated by the growth of different species of plants.

The productive capacity of plants and the climatic conditions in Java and Middle Europe, W. DETMER (*Botanische und landwirtschaftliche Studien auf Java. Jena: Gustav Fischer, 1907, pp. 19–26*).—In cooperative tests with maize grown from Java seed, the production of dry matter in the above-ground parts was 4 to 5 times as great in the moist, warm climate of Buitenzorg, Java, as in the cooler, drier, but less uniform, summer climate of Jena.

Influence of spring precipitation on the yield of oats and potatoes and on the starch content of potatoes, A. ALEXANDROV (*Zeml. Ghaz., 1905, No. 41, pp. 579–581; abs. in Zhur. Opuitn. Agron. (Russ. Jour. Expt. Landw.), 7 (1906), No. 4, p. 515*).—On the basis of experiments at the Viatka Experiment Station the author concludes that for oats May rains are more important than June rains, the optimum precipitation during the vegetation period being about 68 mm.; for potatoes, the greater the precipitation in May and June the less the yield and the starch content, and conversely.—P. FIREMAN.

The relation of a diffusion of heat rays to the season of the year, A. DEFANT (*Separate from Ber. Naturw. Med. Ver. Innsbruck, 30 (1905–6), pp. 17*).

Ground water in Hamburg, A. VOLLER (*Jahrb. Hamburg, Wiss. Anst., 23 (1905), Beiheft 1, pp. 7, charts 4*).—The results of observations during 1905 on ground water as related to temperature and humidity of the air, precipitation, and river levels at Hamburg are reported in detail.

Geology and underground water resources of northern Louisiana, with notes on adjoining districts, A. C. VEATCH (*Geol. Survey La. Bul. 4, pp. 209, pls. 25, figs. 18*).—This paper is made up of excerpts from Professional Paper No. 46 of the U. S. Geological Survey (E. S. R., 18, p. 817).

Underground waters of Missouri, their geology and utilization, E. M. SHEPARD (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 195, pp. X+224, pls. 6, figs. 6*).—This report describes the topography and geology of the State and their relations to artesian waters, discussing in detail the underground supplies of each county. The results of investigations of the sources and qualities of waters used for municipal supplies are also reported.

Ground and deep waters of North Carolina, G. MCCARTHY (*Bul. N. C. Bd. Health, 22 (1907), No. 1, pp. 1–14, figs. 6*).—The arrangement of strata in the Atlantic Coast region, particularly in North Carolina, with reference to underground water supplies is discussed, and examinations of several samples of North Carolina deep water are reported.

Water supply of Nome region, Seward Peninsula, Alaska, 1906, J. C. HOYT and F. F. HENSHAW (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 196, pp. 52, pls. 6, fig. 1*).—This paper gives the results of investigations made during the season of 1906 to determine the water supply available for the economical development of the placer mines and water power of Alaska.

The quality of surface waters in Minnesota, R. B. DOLE and F. F. WESBROOK (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 193, pp. 171, pls.*

7, figs. 4).—This paper "outlines the general characteristics of surface waters in Minnesota and the various factors that tend to modify the quality of the drainage. It includes the results of nearly two years' field and laboratory work done by the United States Geological Survey in cooperation with the Minnesota State board of health. First the general features, both natural and economic, that influence the quality of the meteoric water and impart to the lakes and streams their essential characteristics are reviewed. Next each drainage area is considered in detail, the streams are described, the sources of pollution are discussed, and the results of chemical analyses and bacteriological examinations are given. Statistics are presented regarding practically all of the municipal water supplies in the State and the relative value of the surface and ground waters for general consumption is discussed. At the end is a description of the laboratory methods employed in the chemical and bacteriological work."

Pollution of Illinois and Mississippi rivers by Chicago sewage, M. O. LEIGHTON (*U. S. Geol. Survey. Water-Supply and Irrig. Paper 194, pp. 369, pls. 2, figs. 5*).—This is a digest of the testimony taken in the case of the State of Missouri *v.* the State of Illinois and the sanitary district of Chicago, together with the full text of the decision of the Supreme Court on this subject.

The problem of potable water, E. A. MARTEL (*Presse Méd.* [*Paris*], *1907, No. 28, pp. 217–220, figs. 4*).—This article discusses the sources of water supply for Paris, subterranean waters in limestone or chalk, wells and water levels, effect of droughts and deforesting, microbiology of the waters, temperature, protection against pollution, purification, and sterilization.

Water supply and sewage disposal in France (*Rec. Hyg. Pub., 35 (1905), pp. 386–466, 635–731*).—The character of the water supply and methods of sewage disposal in various towns in France are described in a series of reports to the consulting commission of public hygiene of France, with detailed tabular statements of chemical and bacteriological examinations, the interpretation of the results of analyses of water, and tests of methods of purification.

Sewage irrigation at Paris (*Rev. Sci.* [*Paris*], *5. ser., 7 (1907), No. 21, p. 666*).—This is a note on a recent report to the French Minister of Agriculture on work in the Commune of Achères. The amount of sewage is increasing beyond the capacity of the area to dispose of it, and a large extension of the area or the introduction of other methods of purification are considered imperative.

SOILS—FERTILIZERS.

The influence of soil on vegetation, H. FRICKHINGER (*Ber. Naturw. Ver. Schwaben u. Neuburg, 37 (1904–5), pp. 247–277*).—Previous observations on the relation between the character of soils and the vegetation growing on them are briefly reviewed, the importance of mineral matter for plants, with a compilation of analyses of typical rocks and minerals from which soils are derived, is discussed, and experiments with 17 so-called silica-loving and lime-loving plants are reported. The soils used were: (1) That in which the plants were found growing naturally; (2) coarse-grained weathered dolomite; (3) a mixture of quartz and weathered gneiss, and (4) a mixture of humus, calcareous loam, and quartz. The plants experimented with were: *Spergula arvensis, Lycopsis arvensis, Veronica verna, Scleranthus annuus, S. perennis, Sarothamnus vulgaris, Sagina procumbens, Gypsophila muralis, Farsetia incana, Digitalis purpurea, Helichrysum arenarium, Arabis hirsuta, Laserpitium latiforium, L. siler, Coronilla montana, Erysimum cheiranthoides,* and *Agrostemma githago.*

The results show that a small content of silica and calcium carbonate in the soils did not prevent the plant roots from obtaining the necessary amounts of these materials. The so-called silica-loving plants grew vigorously on weathered dolomite rich in lime, provided the porosity of the material was similar to that of the quartz soils. The so-called lime-loving plants grew badly on a calcareous soil which had been rendered very porous by the addition of quartz. They grew well on a siliceous soil which had been rendered compact by the addition of loam and a little calcareous clay.

It seems clear, therefore, that it is the physical and mechanical properties and not the chemical properties which influence the growth and distribution of plants. The difference in growth on sandy soils and on calcareous and clay soils depends solely upon variations in the mechanical condition of the products resulting from the weathering of various soil-forming rocks.

Some factors influencing soil fertility, O. SCHREINER and H. S. REED (*U. S. Dept. Agr., Bur. Soils Bul. 40, pp. 40, pls. 3*).—This bulletin cites previous experiments by the Bureau of Soils and other investigators which are held to indicate the presence of toxic properties in unproductive soils, manifesting themselves in diminished yields of succeeding crops and in the mutually injurious effects of the roots of trees and other plants, and reports experiments with wheat, oat, corn, and cowpea seedlings to determine the behavior of these plants when grown in fresh non-nutrient agar or in that containing the excreta from previous crops of the same plant or of other plants.

From the facts presented in the bulletin the authors conclude that "it is evident that the production of toxic excretions by the roots of plants is undoubtedly a factor of importance in soil fertility. Many experiments have demonstrated that the accumulation of these toxic excretions may temporarily impair the fertility of certain soils. The foregoing experiments have not only shown that infertility may be due to actual toxic conditions of the soil, but also that the toxic conditions may arise from the growth of vegetation. The data given are just as conclusive in showing that the infertility of the soils was not due to their poverty in plant food constituents. . . .

"In our present state of knowledge it would seem that we must regard the excreta of growing roots as one of the main causes of the low yields obtained in improper crop rotations.

"In some types of soil, influenced perhaps by certain climatic environments, there appear to exist conditions which are unusually favorable to the rapid destruction of toxic excretions. Such soils, when planted year after year to the same crop may not only maintain their original productive powers, but even increase with continued cultivation."

Soil improvement for the worn hill lands of Illinois, C. G. HOPKINS and J. E. READHIMER (*Illinois Sta. Bul. 115, pp. 431-443*).—This bulletin is a report of progress in the land improvement work carried on by the station, chiefly in southern Illinois. A plan of the experiments and earlier results have been previously noted (E. S. R., 17, p. 361).

In summarizing the results with wheat on the Vienna experiment field, taking into account the total yields for the last 3 years, it is shown that untreated land produced 11.8 bu. per acre, while with a leguminous crop the yield increased 11.5 bu., and with lime used in addition to the leguminous crop the increase in yield was 34.3 bu. During this period the use of phosphorus gave a further increase of only 5.6 bu. per acre, and the use of potassium of 10.8 bu. It is pointed out that the direct effect of the lime applied in the form of ground limestone is to increase the growth of the crops for green manuring.

In the corn tests for the last 3 years the untreated land produced 109.2 bu. per acre. The use of a leguminous crop alone increased the yield only 9.8 bu., while with the further addition of lime an increase of 50.7 bu. was secured.

Neither phosphorus nor potassium increased the yield of corn beyond that obtained from the use of a leguminous crop and lime.

In pot culture experiments made with red silt loam of unglaciated hill land there was practically no gain except when nitrogen was supplied either directly in commercial form or indirectly by means of a leguminous crop. The effect of phosphorus and potassium was less where decaying organic matter had been provided in the leguminous crop than where the nitrogen was given in commercial form with but little organic matter. Since 1905 practically no effect has been observed from either phosphorus or potassium when applied in connection with growing leguminous crops for soil improvement. These results bear out conclusively the results obtained in the field tests, that marked improvement can be made on this soil by turning under leguminous crops where lime has been applied.

Another series of pot culture experiments was made with soil from worn gray silt loam hill lands of northwestern Illinois. In these tests the amount of oats secured where nitrogen was applied was about 8 times that where no nitrogen was given Lime alone produced no beneficial results, thus indicating that lime and nitrogen together are necessary on this land.

Notes are given on crop rotations, the use of the crops, and the use of fertilizers in soil improvement A rotation for the worn hill lands of southern Illinois, consisting of corn the first year, cowpeas or soy beans the second, wheat the third, clover and timothy meadow the fourth, and pasture the fifth and sixth years is suggested.

Improvement of upland timber soils of Illinois, C. G. Hopkins and J. E. Readhimer (*Illinois Sta. Circ. 109, pp. 8*).—This circular briefly summarizes the more practical results of field experiments carried on in a representative area of the ordinary gently rolling upland timber soils of northern and central Illinois. The profitable system of improvement for such soils, as indicated by the results of these experiments, "is to grow legumes in the crop rotation and make as much manure as possible to maintain the supply of humus and nitrogen and to purchase somewhat more phosphorus, in the form of pure steamed bone meal or fine-ground raw rock phosphate, than is removed from the soil by cropping, so that the soil will grow richer rather than poorer."

The action of water and aqueous solutions upon soil phosphates, F. K. Cameron and J. M. Bell (*U. S. Dept. Agr., Bur. Soils Bul. 41, pp. 58, figs. 5*).—This bulletin reviews the literature bearing on this subject and reports experiments on the action of water on monocalcium, dicalcium, and tricalcium phosphate: the behavior of the three-component system—lime, phosphoric acid, and water—and the four-component system—lime, phosphoric acid, sulphuric acid, and water; the action of solutions of carbon dioxid, sulphurous acid, citrates, ammonium compounds, calcium salts, potassium chlorid, sodium nitrate and chlorid, and other solvents on the phosphates of calcium; and of the behavior of superphosphates and magnesium, iron, and aluminum phosphates under similar treatment. The following is the authors' summary:

"In this bulletin it has been shown that the soil phosphates are decomposed or hydrolyzed by water, with the formation of other phosphates containing relatively more of the base.

"Neutral salts in solution have a marked effect upon the amount of phosphoric acid and of lime going into solution from a lime phosphate, generally increasing both. Lime salts generally decrease the amount of both in solution, as do alkaline solutions, while acid solutions increase it.

"Neutral salts have, however, little effect upon the solubility of the phosphates of iron or alumina, and it is impossible to predict the direction of the effect. Salts which hydrolyze with the formation of acid or alkaline solutions increase the amount of phosphoric acid yielded to the solution by the phosphates of iron and alumina. The phosphates of the soil, whether solid solutions or definite chemical compounds, are of such a nature as to yield a solution containing very small quantities of phosphoric acid. Inasmuch as all soils contain far more basic matter than is sufficient to combine with the phosphoric acid, the least soluble phosphates are the ones which will be formed and will control the concentration of the soil moisture. This fact, together with the well-known phenomena of absorption, gives a satisfactory explanation of the observation that the concentration of the soil moisture is low and varies but little for different soils and with the total amount of phosphoric acid in the soils. For the same reason, the addition of phosphatic fertilizers can not be expected to influence materially the concentration of phosphoric acid in the soil moisture.

"The action of phosphatic fertilizers is, therefore, on the soil and not primarily on the plant; for the concentration in plant food constituents of the solution on which the plant feeds is not materially altered by the addition of phosphatic fertilizers in the amounts used in ordinary field practice.

"The changes in both solution and solid which take place during the progress of leaching superphosphates have been described."

The action of straw manure on the fertility of soils, L. HILTNER and L. PETERS (*Arb. K. Biol. Anst. Land u. Forstw., 5 (1906), No. 3, pp. 99-125; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 534, II, p. 296*).—Pot experiments with lupines and oats grown on lupine and potato soils and fertilized with lupine straw, alone or with the addition of potassium nitrate, and in all cases with a basal ration of potash and phosphoric acid, are reported.

The growth of the oats was retarded by the application of lupine straw. The lupines were not affected. The second year the growth of oats was greater after lupines than after oats. The after-effect of lupine straw on oats following lupines was very favorable, increasing the yield about 50 per cent, so that the net effect of the lupine straw for the first and second years was good. The addition of nitrate increased the effect of the straw. In case of oats following oats the average gain from the use of lupine straw was only about 19 per cent, making a net loss for the 2 years.

Field experiments with lupines, seradella, robinia, peas, and beans gave similar results. Alfalfa was injured by the application of the straw. The favorable action of the robinia straw, which is very woody, was particularly marked. Straw extract greatly increased the yield of mustard, indicating that it is the insoluble matter of the straw which produces the injurious effects.

Recent progress in investigations on nitrification, P. EHRENBERG (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 13, pp. 134–137*).—This is a brief review of recent investigations by Winogradski, Schloesing, Kellner, Godlewski, Boullanger, and Massol, the author, and others.

On changes of availability of nitrogen in soils, I, O. LOEW and K. ASO (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 443–448*).—From a study of the character of the nitrogenous excretions from living and dying yeast cells and from investigations on the effect of sterilizing soil by carbon bisulphid and heat, the authors conclude that "on the death of cells all soluble matters can pass through the cytoplasm to the outside. Peptones and mineral nutrients are excreted largely by dying yeast cells and very probably also by the microbes of the soil. This phenomenon throws some light on the beneficial action on crops of bisulphid of carbon when applied to soils."

The activity of bacteria in soils, V. BROMBERG (*Illus. Landw. Ztg., 27 (1907), pp. 177, 178; abs. in Chem. Abs., 1 (1907), No. 10, p. 1309*).—The dependence of nitrogen-fixing bacteria upon the organic matter of the soil is discussed.

Assuming that 1,000 gm. of organic matter is used by bacteria in fixing 8 gm. nitrogen, it is estimated that on a soil containing 2 per cent humus the organisms would produce 42 lbs. nitrogen per acre per year. Increasing the amount of organic material or source of energy in the soil by the addition of humus-forming substances and by cultivation, or by favoring the growth of algæ, tends to raise the nitrogen-accumulating power of the soil. Fallow favors bacterial action most. Plats inoculated with nitrogen-fixing organisms produced 18 to 56 per cent more dry matter and 23 to 130 per cent more nitrogen than uninoculated plats in the case of soy beans, lupines, and seradella.

Further experiments on nitrogen-fixing bacteria, KEDING (*Wiss. Meeresunters. Abt. Kiel, 9, p. 275; abs. in Centbl. Bakt. [etc.], 2. Abt., 18 (1907), No. 10–12, pp. 351–353*).—The author reviews work of other investigators and reports experiments of his own on the nitrogen-fixing bacteria found in sea water and in soils of various kinds. He confirms the conclusion of Keutner that Azotobacter occurring in sea water is, in all respects, similar to that found in soils. Sodium chlorid was found to favor the growth of this organism.

The organism was found in all soil samples examined except those from moor lands. Its fixing power was not affected either by the air drying of soil in which it occurred during 11 months or by rapid drying over sulphuric acid. The organism was capable of assimilating the nitrogen of the air in pure cultures. This power was not increased by associative action of other bacteria and the nitrogen compounds of the air were also without influence.

The use of nitrobacteria in Mexican agriculture, C. MACIAS (*Bol. Sec. Fomento [Mexico], 6 (1906), Nos. 4, pp. 74–78; 6, pp. 257–263, pls. 3; 7, pp. 267–274; 8, pp. 291–309*).—This is a preliminary report on investigations made under the auspices of a special commission on agricultural parasitology, appointed by the Mexican government to study especially the root tubercle organisms of leguminous plants. The report, however, summarizes information regarding all of the more important organisms which are known to fix and transform nitrogen in the soil, as well as those assimilating nitrogen of the air in symbiosis with leguminous plants.

Information regarding the preparation and use of efficient nitragin cultures is given with considerable fullness, the general conclusion being reached that inoculation with this material is not applicable to all soils, but that the individual soil conditions must be studied and that in any case only the more virulent organisms should be used.

The inoculation question in soil bacteriology, P. EHRENBERG (*Fühling's Landw. Ztg., 56 (1907), No. 9, pp. 301–311*).—The progress of investigation on this subject is briefly reviewed, special attention being given to the relative merits of soil and seed inoculation. The conclusion is reached that notwithstanding some disadvantages in its present stage of development, seed inoculation is a satisfactory, cheap, and convenient method when carried out with proper precautions.

Fertilizers, E. B. FERRIS (*Mississippi Sta. Bul. 99, pp. 16, figs. 3*).—This bulletin summarizes the results of 5 years' experiments with fertilizers, manures, and restorative crops on fruits, vegetables, and staple farm crops at the McNeill substation, which is situated on sandy and sandy loam soil "similar to those which occur throughout the long leaf pine belt, which occupies an area of some 15,000 square miles, or practically one-third of the entire State."

Analyses of samples of soil and subsoil from the experimental field showed the following results:

Analyses of soil and subsoil from McNeill substation, Mississippi.

	Soil.	Subsoil.
	Per cent	*Per cent*
Sand	53.440	48.780
Silt	28.650	28.370
Fine silt	3.860	3.450
Clay	5.400	11.920
Phosphoric acid	.023	.017
Potash	142	210
Lime	.220	.170
Magnesia	.162	.140
Iron oxid and alumina	4.800	7.830

The requirements of Mississippi soil of the type experimented with for phosphoric acid, potash, and nitrogen, and the kinds of fertilizer suited to cotton, corn, winter grains, sweet potatoes, sugar cane, cowpeas, peanuts, vegetables, and fruits are discussed as well as methods of application.

The author's conclusions are as follows:

"It is estimated that the farmers of the fertilizer belt of Mississippi are spending $100,000 annually for the purchase of potash in their fertilizers. So far as results at McNeill go to show, this money is practically wasted, and we would urgently insist that the thinking men of the State, merchants, farmers or manufacturers, who can control the composition of fertilizers, either discontinue the use of potash or convince themselves that it is necessary under their own conditions. The McNeill Station would also insist on the use of less cotton-seed meal applied directly to crops, provided, of course, the farmers themselves would get the nitrogen that the soils need from other sources. Cowpeas will supply this nitrogen and they can be grown every year after corn, oats, and practically all vegetables. By rotating the crops cowpeas may also be made to furnish a large part of the nitrogen to such crops as cotton, strawberries, and sugar cane, occupying the land one year or longer. Spanish peanuts will add much nitrogen to soils, especially if hogs are allowed to graze them off, and there is certainly no surer money-maker on the farm than pork grown and fattened on such crops. The growing and feeding of cattle in our State, except for dairy purposes, has not on the whole been profitable, yet we are convinced by work done here, that by buying and selling judiciously, we may, under average conditions, feed cotton-seed products to cattle and get the manure on the land as a profit. [In parking experiments carried on] since 1903 the average yearly increase in yield of corn and cotton, due alone to the manure from cattle, has been 848 lbs. of seed cotton per acre and 21.4 bu. of corn per acre."

Every farmer his own experimenter, H. B. M. Buchanan and J. J. Willis (*Mark Lane Express, 96 (1907), Nos. 3930, pp. 52, 53; 3931, p. 86; 3932, p. 111; 3933, p. 145; 3934, p. 180; 3935, p. 211; 3936, p. 242; 3937, p. 273; 3938, p. 305; 3939, p. 337; 3940, p. 365; 3941, p. 391; 3942, p. 418; 3943, p. 447; 3944, p. 476; 3945, p. 509; 3946, p. 542; 3947, p. 581; 3948, p. 609; 3949, p. 641*).—This article undertakes to present in clear and simple language some of the more important and practical principles governing the general manuring of farm crops, the results of a few experiments showing how these principles have been applied in a practical and profitable way, and to induce farmers to undertake experiments for themselves in a small way.

On the influence of different methods of applying fertilizers on their efficiency, P. Holdefleiss (*Sächs. Landw. Ztschr., 55 (1907), Nos. 1, pp. 3–5; 2, pp. 32–34*).—A brief general discussion of the subject.

Studies of changes which take place in nitrogen when added to soils in different forms of combination, W. A. WITHERS (*North Carolina Sta. Rpt. 1906, pp. 15–18*).—This is a brief summary account of the work of the year in the chemical department of the North Carolina Station which dealt mainly with the changes which nitrogenous matter undergoes in the soil, and is a continuation of previous work along the same line (E. S. R., 17, p. 344). The nitrogenous compounds experimented with were asparagin, ammonium sulphate, sodium nitrite, and sodium nitrate. When these materials were mixed with sterilized soil and immediately extracted by shaking with water for 4 hours about 88 per cent of asparagin and of ammonium sulphate, 92 per cent of sodium nitrate, and only 59 per cent of sodium nitrite were recovered.

The colorimetric method for the determination of nitrites, proposed by the Bureau of Soils, was used in these investigations. As a means of decolorizing the nitrite solutions lampblack extracted with alcohol or gasoline was found to be satisfactory as was also the treatment with ammonia and alum combined, the alum being used in excess.

In soils with or without addition of the nitrogenous compounds named there was no production and some reduction of nitrates or nitrites during February but a considerable formation in September. At the latter period the soil treated with asparagin produced nitrites but no nitrates and that treated with ammonium sulphate produced nitrates but no nitrites. The conclusion is therefore reached "that the oxidation of organic nitrogen and of ammoniacal nitrogen is accomplished by different organisms."

Other observations are reported which indicate that nitrifying organisms are readily transferred from the soil of one pot to that of another by natural agencies. Apparently the nitrous organism is more resistant than the nitric organism but less resistant than the reducing organism. Other lines of work which are in progress or contemplated are briefly referred to.

The interaction of ammonium salts and the constituents of the soil, A. D. HALL and C. T. GIMINGHAM (*Jour. Chem. Soc. [London], 91–92 (1907), No. 534, pp. 677–687*).—In view of the observation that the application of neutral ammonium salts, such as sulphate and chlorid, has resulted in the production of an acid reaction in soils, the authors undertook the investigations which are here reported to determine the actual effects which are produced when dilute solutions of ammonium salts are brought in contact with the separate approximate constituents of soils, viz, sand, clay, humus, and calcium carbonate. The method of procedure was, in general, to shake 100 gm. of dry material for 24 hours with a solution of 300 cc. of a solution of ammonium salts, then to determine whether there had been any increase in acidity or evolution of ammonia.

The trials with sand gave absolutely negative results and are not reported. In the case of clay there was no change of reaction and no withdrawal of the acid radicle from the solution. The reaction of the ammonium salts on the clay was apparently purely one of double decomposition. Complete absorption of the base did not occur even when as much as 50 gm. of clay to 1.6 gm. of ammonium chlorid was used. Much the same results were obtained with ammonium carbonate and phosphate as with ammonium chlorid.

In the case of the phosphate and carbonate, some of the acid was also removed from solution. It was observed that when ammonium salts were used in excess of the clay, reaction proceeded until a definite point was reached and then stopped, "so that a given weight of clay removes the same amount of ammonium from solution, whatever the strength of the solution of ammonium salt with which it is in contact." It was found that when varying quantities of clay were shaken with fifth normal and tenth normal solutions of ammonium chlorid, 100 gm. of clay withdrew approximately 0.147 gm. of ammonium from solution, whatever the quantity of solution with which it was in contact. This proportion, however, was found to vary with different samples of clay used.

When calcium carbonate was shaken up with solution of ammonium salts the reaction was of the same type as with clay. The addition of 10 gm. of calcium carbonate to 50 gm. of clay increased somewhat the precipitation of ammonium, but did not change the type of the reaction. "Since few soils would contain as much as 10 gm. of calcium carbonate per 50 gm. of clay, it may be concluded that the main reaction when ammonium salts are applied to the soil takes place with the clay, although the calcium carbonate will afterwards continue to decompose the zoolitic ammonium compound as ammonium carbonate is removed by nitrification."

Experiments of similar character with different kinds of peat showed that there was no production of acidity when any of the samples of humus were shaken up with the solutions of ammonium salts. In experiments with peat, which had been extracted with hydrochloric acid and thoroughly washed with hot distilled water, there was apparently a slight production of acid and withdrawal of ammonium from solution. The ammonium had been replaced by calcium, small quantities of which had remained in the peat in spite of the treatment it had received. "It seems, however, certain that free 'humic acid' can to some extent decompose ammonium salts with the formation of an insoluble ammonium compound, and this is confirmed by the observation that whereas the humus, after all mineral acid had been washed away, yielded a brown solution on shaking with pure water, when shaken with the ammonium salt a colorless solution resulted. As free 'humic acid' does not appear to be a normal constituent of soils, this experiment does not vitiate the general conclusion reached by the authors that the constituents of the soil do not react with solutions of ammonium salts to produce a free acid. For the acid observed in the field experiments quoted a biological origin has now been found."

Can calcium carbonate cause loss of ammonia by evaporation from the soil? T. TAKEUCHI (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 433–436*).—From a study of the reaction between calcium sulphate and ammonium carbonate and calcium carbonate and ammonium sulphate, the author concludes that "there is no danger of losing any significant amount of ammonia by manuring a soil with ammonium sulphate where calcium carbonate is present."

The cause of the lower efficiency of ammoniacal nitrogen as compared with nitric nitrogen (*Abs. in Saaten, Dünger, u. Futtermarkt, 1907, No. 17, p. 483*).—The conclusion of Wagner that the lower efficiency of ammoniacal nitrogen is due to loss of ammonia in soils containing calcium carbonate is briefly referred to.

On the prospects for natural and artificial nitrogenous compounds in the service of agriculture, K. RÖRDAM (*Tidsskr. Landbr. Planteavl, 12 (1905), pp. 381–410*).—A detailed discussion of the present sources of nitrogenous fertilizers and the prospects for their use for agricultural purposes.—F. W. WOLL.

On the exhaustion of the Chilean nitrate of soda deposits, W. OBST (*Saaten, Dünger, u. Futtermarkt, 1907, No. 11, pp. 313–317*).—The possibility of the exhaustion of the Chilean deposits and of supplying nitrogen compounds by artificial means is discussed.

Nitrate of soda propaganda (*Asoc. Sal. Propaganda, Circ. Trimest. 41, 1907, pp. LXVI+165*).—Detailed statistics of production and consumption of nitrate of soda are given, with reviews of investigations relating to the production of nitrogen compounds from the air and their comparison with nitrate of soda as a fertilizer.

Lime nitrogen as a commercial substitute for nitrate of soda, A. Frank (*Illus. Landw. Ztg., 27 (1907), No. 43, pp. 388–391*).—In this paper, which was read before the International Congress of Agriculture at Vienna, the author discusses the commercial possibilities of lime nitrogen in an optimistic manner.

On lime nitrogen, I, G. Bredig et al. (*Ztschr. Elektrochem., 13 (1907), No. 9, pp. 69–75; abs. in Chem. Abs., 1 (1907), No. 10, p. 1224*).—The authors maintain that neither the theory of a high temperature of reaction nor that of finely divided carbid explains the absorption of nitrogen by calcium carbid in presence of calcium chlorid and other substances. They believe that calcium chlorid acts as a catalyzer.

Experiments were made at 800° and 700°, the calcium carbid being heated electrically in a nitrogen atmosphere. The temperature was read by means of a thermo-couple and kept constant either by shutting off the supply of nitrogen or by diminishing the heating current. At 800° a mixture of calcium carbid with 10 per cent of calcium chlorid absorbed in 2 hours 22 per cent of nitrogen, and calcium carbid alone only 3.1 per cent. Other substances, such as lithium chlorid and sodium chlorid, act also as catalyzers, but to a smaller extent; lime, magnesia, calcium fluorid, and sea sand have little or no action. At 700° the rapidity of the reaction decreases, but much more in case of calcium chlorid than in that of lithium chlorid or sodium chlorid.

On atmospheric nitrogen fertilizers, H. Briem (*Centbl. Zuckerindus., 15 (1907), No. 30, pp. 816–818*).—Progress in the manufacture of lime nitrogen and lime niter and in tests of the fertilizing value of these materials is briefly reviewed with a short bibliography of the more important investigations relating to the subject.

Nitric acid from the air (*Ztschr. Electrochem., 13 (1907), Nos. 9, pp. 75–77, figs. 2; 18, pp. 190–198, figs. 24; 19, pp. 210–221, figs. 28; 20, pp. 225–234, figs. 36; 21, pp. 237–255, figs. 61; 22, pp. 280–286, figs. 11*).—The various technical processes and apparatus which have been devised for the artificial production of nitric acid from the air are quite fully described in this article.

On the electro-synthetic production of certain nitrogenous compounds of agricultural value, Bruttini (*Bol. Quind. Soc. Agr. Ital., 12 (1907), No. 7, pp. 245–248*).—A brief review of recent progress in the manufacture of such products.

Norwegian lime niter, I. Bjerknes (*Tidsskr. Norske Landbr., 13 (1906), No. 9, pp. 385–396*).—The article contains an illustrated description of the Notodden lime-niter factory (Birkeland-Eyde process).—F. W. Wool.

Fertilizer experiments with lime nitrogen and Norwegian lime niter, H. von Feilitzen (*Deut. Landw. Presse, 34 (1907), Nos. 28, pp. 229, 230; 29, p. 243*).—In pot experiments with oats, barley, spring wheat, and potatoes on sand and loam soils lime nitrogen was very nearly equal to ammonium sulphate. With oats, barley, spring wheat, on moor soil of better quality the action of the lime nitrogen was also good, but very poor and much inferior to other fertilizers on oats and potatoes on moor soils which were not well decomposed. The lime niter was fully equal in effect to nitrate of soda in experiments with oats on sand and moor soils. In fact the lime combination with nitrate seemed somewhat better for oats than the sodium compound. The investigations were in continuation of earlier work (E. S. R., 17, p. 17; 18, p. 19).

Further comparative experiments with lime nitrogen and lime niter on barley and oats, R. Otto (*Deut. Landw. Presse, 34 (1907), No. 36, pp. 295, 296*).—In plat experiments on different kinds of soil the results with lime nitrogen were somewhat inferior to those with nitrate of soda.

On bat guano from Marianne Islands, S. Kanamori (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 461–464*).—Pot experiments with barley to test the availability of the nitrogen of this guano, a large part of which is in the form of chitin, are reported. The results show that the undecomposed chitin is not a readily available source of nitrogen.

Concentration of sugar beet vinasse for fertilizer, M. P. Kestner (*Betterave, 1906, No. 411, pp. 403–406; abs. in Chem. Abs., 1 (1907), No. 9, pp. 1159, 1160*).—Instead of using the vinasse for recovery of potash as usual, it is proposed to mix the dried vinasse with peat or other absorbent material and thus prepare a fertilizer containing nitrogen as well as potash. The increased cost of preparation is said to be offset by the higher value of the product.

Continued test of nine phosphates with different plants, H. J. Wheeler and G. E. Adams (*Rhode Island Sta. Bul. 118, pp. 55–86*).—A previous bulletin reported the results of these tests up to and including 1901 (E. S. R., 18, p. 619). This bulletin reports a continuation of the tests with soy beans in 1902; with Alaska peas, beans, squashes, potatoes, ruta-bagas, turnips, mangel-wurzels, barley, millet, oats, cabbage, tomatoes, lettuce, spinach, and crimson clover in 1903; and with oats in 1904; also with redtop following the miscellaneous crops grown in 1903.

The experiments embraced tests of the relative efficiency of the same 9 phosphates (dissolved boneblack, dissolved bone, acid phosphate, fine ground bone, basic slag meal, floats, raw and roasted redondite, and double superphosphate) used in previous trials on the same soil, limed and unlimed. The applications of phosphates were equalized for the first time in 1902, sufficient amounts of each phosphate being added in that year to bring the rate of application for the entire period, 1894–1904, up to 67.12 lbs. of phosphoric acid per acre per annum.

As in previous trials liming greatly increased the efficiency of roasted redondite but was without influence on the raw redondite, as "in several cases in the limed series the results were better without than with the raw redondite."

"In the unlimed series neither the raw nor roasted redondite proved to be of much practical value when used in connection with most of the varieties of plants. The crimson clover, potato, and especially the Japanese millet, oat, and golden millet, furnished, however, some notable exceptions.

"Floats gave very good results with the soy bean, peas, crimson clover, mangel-wurzel (on limed land), barley (on limed land), potato (on unlimed land), Japanese millet, oat, and golden millet, but they proved highly inefficient especially for the Hubbard squash, ruta-baga, crook-neck squash, flat turnip, cabbage, mangel-wurzel (on the acid unlimed land), tomato, lettuce, New Zealand spinach, and red valentine bean.

"As a rule in the unlimed series, especially in the case of plants which are subject to injury by acid soils, double superphosphate failed to give good results. The same inferior action, in a less degree, was observed in the case of certain plants both with dissolved boneblack and acid phosphate.

"In one or two cases the results with acid phosphate were quite poor even in the limed series, but whether this was incidental or due to the presence of some compound peculiar to this substance, which is particularly toxic to certain plants, remains to be determined. . . .

"Basic slag meal and fine ground bone proved to be excellent phosphatic manures for acid soil, the former being immediately efficient and the latter becoming so after remaining in the soil for 2 or 3 years or long enough for extended decomposition to result.

"These results ought to show that attention must be paid to the kind of crop, the kind of phosphate, and the kind of soil, if one will make sure that the phosphoric acid shall pay proper returns for the money employed in its purchase."

The influence of contact with the soil on the absorbability of soluble phosphates, C. SCHREIBER (*Rev. Gén. Agron., n. ser., 2 (1907), No. 2, pp. 49–53*).—Pot experiments with superphosphate, Thomas slag, and precipitated phosphate on ferruginous soil are reported which show that prolonged contact with the soil destroys the absorbability of available phosphates. This retrogression varies with the character of the phosphate, being much greater in the case of superphosphates than of Thomas slag and precipitated phosphate.

Wolters phosphate, E. WEIN (*Deut. Landw. Presse, 34 (1907), No. 35, pp. 289, 290*).—Comparative plat tests of Wolters sodium phosphate and potassium phosphate, superphosphate, and Thomas slag on mustard, meadows, potatoes, barley, oats, and clover, show the Wolters phosphate to be readily available and as effective as superphosphate.

Ground limestone for acid soils, C. G. HOPKINS (*Illinois Sta. Circ. 110, pp. 19, figs. 5*).—The character and action of caustic and carbonate lime are briefly explained. The advantages of limestone over caustic lime for use under ordinary conditions in Illinois are pointed out, and the best methods of applying lime on such soils are outlined.

"As a general rule, we should use lime only to correct the acidity of the soil, and this is necessary only where there is difficulty in obtaining a good stand and luxuriant growth of a leguminous crop, such as red clover. As to the form of lime to use for this purpose, the farmer must be governed somewhat by the cost of the material. Fine-ground limestone will be both the best and the most economical form of lime to use wherever it can easily be obtained. If caustic lime be used, we should make special provision to maintain the humus in the soil."

The conclusions drawn are based upon experiments by the Pennsylvania and Maryland stations, as well as on those carried on for a number of years by the Illinois Station. As an average of 50 tests carried on by the latter station "during the last 3 years on the soil experiment fields at Vienna in Johnson County, at Cutler in Perry County, at Dubois in Washington County, at Odin in Marion County, and at Edgewood in Effingham County, the value of the increase produced by lime or ground limestone has been $2.69 an acre a year, counting corn worth 35 cts. a bushel, oats 25 cts., wheat 70 cts., and clover hay worth $6 a ton. As an average of 20 tests on these fields, the yield of corn has been increased 6.6 bu., and as an average of 18 tests the yield of wheat has been increased 4.8 bu. per acre, both of these crops being grown in rotation with legume crops on both the limed and unlimed land. As an average of 7 tests the yield of clover has been increased 0.37 ton of air-dry hay per acre, and liming has increased the yield of oats 10 bu. per acre, but this is an average of only 5 tests."

AGRICULTURAL BOTANY.

Some factors determining the structure of plants, J. LAURENT (*Rev. Gén. Bot., 19 (1907), No. 220, pp. 129–160*).—A study was made of a number of the factors that determine the structure of plants, and as a result of his investigations the author concludes that of the internal factors changes in turgescence through changed osmotic pressure produce the principal variations in growth, and that of a considerable number of specific factors studied those capable of increasing osmotic pressure are capable of influencing the structure of the plant. A bibliography is appended.

Notes on polyembryony, M. T. COOK (*Torreya, 7 (1907), No. 6, pp. 113–117, figs. 3*).—On account of the importance of plant-breeding experiments with tropical fruits, the author describes cases of polyembryony in the mango and the rose apple. The mango, which is recognized as a very important fruit in the Tropics, is being studied with a view to securing improved varieties, but in connection with breeding experiments the possiblity of several embryos must be considered.

The effect of acids, alkalis, and neutral salts on the fermentative activity of yeast cells, E. DRABBLE and DAISY G. SCOTT (*Bio-Chem. Jour., 2 (1907), No. 7–8, pp. 340–349, dgm. 1*).—An account is given of observations on the effect of acids, alkalis, and neutral salts on the rate of fermentation induced by yeast cells and also some notes on the rate of multiplication of yeast cells in culture media to which a neutral salt had been added to increase the osmotic pressure. The solutions employed were sodium chlorid, potassium chlorid, sodium nitrate, potassium nitrate, hydrochloric acid, nitric acid, sodium hydroxid, and potassium hydroxid, all of which were made up in various fractional portions of gram-molecular strength.

The neutral salts failed to exercise any marked inhibiting action on the fermentative activity of yeast when added to sugar solutions in strengths of 0.1, 0.01, 0.001, and 0.0001 gram-molecule. Sodium and potassium hydroxids of 0.1 gram-molecular strength entirely prevented fermentation. The weaker strengths depressed the action, while 0.0001 affected the process but little. Hydrochloric and nitric acids of the weaker strengths depressed the action of yeast and at 0.1 strength entirely prevented fermentation and completely inhibited the reproduction of yeast. The lower concentrations permitted slight reproduction of the cells. In all strengths of the neutral salts employed the cells reproduced actively. The hydroxids were found to be destructive at a concentration of 0.1 gram-molecule and at this strength prevented any reproduction. At the lower concentrations, except 0.01 per cent potassium hydroxid, reproduction took place.

In a series of cultures containing sodium nitrate of strengths differing by one-tenth from 1.0 to 0.1 gram-molecule the greatest reproduction was found in the media containing 0.2 sodium nitrate. From this stage increasing strengths of the salt depressed the activity until no reproduction took place at 0.7 per cent. At greater strengths than this the solutions proved destructive to some of the cells.

Recent investigations on the development of the ascomycetes, P. CLAUSSEN (*Ber. Deut. Bot. Gesell., 24 (1906), Generalversammlungs-Heft, pp. 11–38, figs. 7*).—A review is given of some of the more recent literature relating to the life history of the ascomycetes. A bibliography of about 100 titles is included.

Utilization of nitrogen in air by plants, II, T. JAMIESON (*Agr. Research Assoc. [Scot.] Rpt. 1906, pp. 29–117, pls. 2; abs. in Chem. News, 95 (1907), No. 2474, p. 203*).—Experiments are reported upon that were conducted to prove that plants take up nitrogen from the air by means of special trichomes, called by the author "albumin generators," which were described in a previous communication (E. S. R., 18, p. 125).

Cultures were made in pots as well as water cultures with rape, cress, frogbit, azolla, chickweed, and mimulus, which are reported upon in detail. It appears that gains in nitrogen were made by each of these plants. Expressed in percentages of dry weight the gains were as follows: Rape 3.998, cress 2.693, frogbit 2.105, azolla 1.876, chickweed 0.541, and mimulus 0.392 per cent. The details of the analyses are given in an appendix to the report.

Root action and bacteria, S. PICKERING (*Nature [London], 76 (1907), No. 1962, pp. 126, 127*).—In previous publications (E. S. R., 15, p. 474) it is shown that injurious effects followed the growing of grass over the roots of freshly planted apple trees at the Woburn experimental fruit farm. The conclusion at that time was that the effect was due to a poison produced either directly by the grass or indirectly through the agency of bacteria. Subsequent investigations have strengthened the view that bacteria are probably the principal agents in causing the injury.

In investigating this subject trees were planted in pots, the soil of some of which was sterilized, others partially sterilized, and some untreated. All those which were untreated started growth immediately, while of the 9 in sterilized soil, 2 started about 2 days later than those unsterilized or those in which the soil had been partially sterilized, 6 were retarded for at least 14 days, and 1 did not grow at all. It is believed that sterilization, while not destroying all the bacteria, did have the effect of killing some bacteria which are connected with root activity.

The nature of starch and its reactions depending upon different media, J. Wolff (*Rev. Gén. Sci., 18 (1907), No. 11, pp. 459–464*).—Attention is called to the differences noted between starch as it exists in the leaves and other green organs of plants and that deposited as reserve material in various parts of the plant.

The effect of malt diastase on starches of different origin and at different temperatures is described. The proportion of starch transformed in experiments with malt diastase was found to vary with the temperature. Only 5 per cent of potato starch was transformed at 55° C., while 90.3 per cent was transformed at 65°, the temperature at which this starch becomes gelatinized. The average of a number of samples of rice showed 9.7 per cent transformed at 55° and 31.1 per cent at 65°, the gelatinization of this starch taking place at 80°. Of barley starch 53.3 per cent was transformed at 55° and 96.2 per cent at 65°. Wheat starch was transformed to the extent of 62.2 per cent at 55° and 94.6 per cent at 65°. No cornstarch was transformed by the malt diastase at a temperature of 55°, 18.5 per cent was transformed at 60°, and 54.6 per cent at 65°. Other starches showed a wide variation, and considerable differences are noted for starches from different varieties of the same plant.

The changes of starch during germination and the action of diastases under the influence of various chemical and physical agents are discussed at some length.

On the occurrence of sucrase and saccharose in different parts of the grape, V. Martinand (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 24, pp. 1376–1379*).—In a previous publication (E. S. R., 13, p. 225) the author called attention to the occurrence of invertin or sucrase in grapes, grape must, and wine, remarking that the enzym occurred in considerable quantity, sufficient to ferment all the sugar contained in the fruit.

In the present paper the author gives an account of investigations to determine the distribution of sucrase, and he finds that it occurs in practically every part of the grapevine. Saccharose was observed in the leaves, in the pulp of the grape, and in small quantities in the roots, but he was not able to recognize it in the juice obtained from the grapes without pressure, nor in the woody part of the vine.

From his investigations the author concludes that the hydrolysis of saccharose may take place in any of the parts of the grape through the intervention of sucrase occurring naturally in it, and that there is always a considerable excess of the enzym which is capable of fermenting the must obtained under pressure as well as the saccharose which may be added. Without this ferment it would be necessary to resort to the use of yeast or other hydrolyzing agents in the fermentation of the grape juice.

On the relation between the magnesium oxid and calcium oxid in the leaves of various plants during different periods of growth, J. Seissl (*Ztschr. Landw. Versuchsw. Oesterr., 10 (1907), No. 3, pp. 88–101*).—The author investigated the ratio between the calcium and magnesium oxid content of a considerable number of plants at various periods of their development.

About 20 species of vascular plants were subjected to analysis and the results obtained are given in tabular form. The experiments covered portions of 3 seasons, and slight fluctuations were noted between the ratio of these 2 substances in the ash analyzed in different years. In nearly every instance there was a progressive increase in the ratio of the lime to the magnesia content toward autumn. In only 2 samples of vascular plants was the lime content greater than that of the magnesia. Similar ratios were obtained for a number of seaweeds, but in an analysis of a number of fungi, mostly basidiomycetes, the lime content was only about one-third that of the magnesia.

Phaseolunatin and the associated enzyms in flax, cassava, and Lima beans, W. R. DUNSTAN, T. A. HENRY, and S. J. M. AULD (*Proc. Roy. Soc. [London], Ser. B, 79 (1907), No. B532, pp. 315–322*).—It having been stated that several cyanogenetic glucosids may exist in the Java beans instead of one, as reported in the previous paper (E. S. R., 18, p. 330), the authors have reviewed their previous investigations and claim that in the Java beans there is no cyanogenetic glucosid except phaseolunatin. This glucosid is said to be identical with linamarin in flax and the enzyms of the Lima beans, flax, and cassava decompose it.

A study was made of the enzyms present in Lima beans, and there seems to be evidence to establish the identity of the α-enzym with yeast maltase. Since, however, the enzym preparation obtained from Lima beans decomposes amygdalin and salicin, it is believed to also contain a β-enzym identical with or similar to emulsin. A mixture of the 2 enzyms is believed to occur in cassava and flax, as enzym preparations from these sources behave in identically the same manner as preparations obtained from Lima beans. It is further stated that yeast is capable of decomposing phaseolunatin, amygdalin, and salicin, and on this account it is assumed to contain an emulsin-like enzym as well as maltase.

Investigations on the separation of vicianin and its diastase from the seeds of various leguminous plants, G. BERTRAND and L. RIVKIND (*Bul. Soc. Chim. France, 4. ser., 1–2 (1907), No. 9, pp. 497–501*).—The authors have made a study of the seeds of about 60 species of leguminous plants, representing more than 40 genera, and report that most of them contain the diastase emulsin, which is capable of hydrolyzing vicianin. The glucosid, however, is only found in species of the genus Vicia and in not all of the species of that genus. It was found that *Vicia narbonensis* did not contain either the diastase or vicianin.

The Leguminosæ of Porto Rico, JANET PERKINS (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 10, No. 4, pp. 133–220 + IX*).—Descriptions are given of the species of leguminous plants known to occur in Porto Rico, and their distribution throughout the West Indies is indicated. Sixty-seven genera and 141 species are described, and notes are given on the uses of such as are known to have economic value.

Sumac and its sophistication, E. COLLIN (*Jour. Pharm. et Chim., 6. ser., 25 (1907), No. 12, pp. 603–610, fig. 1*).—A description is given of true sumacs which are said to consist of the leaves of *Rhus coriaria* and *R. cotinus*, and attention is called to a number of varieties of leaves commonly used in the falsification of these tannin materials. Among the more common are inferior varieties of Rhus, such as *R. glabra* and *R. metopium*, and the leaves of *Pistacia lentiscus*, *Tamarix africana*, *Coriaria myrtifolia*, *Osyris compressa*, and *Ailanthus glandulosa*.

FIELD CROPS.

Farm practice in the Columbia Basin uplands, B. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 294, pp. 30, figs. 9*).—A description of the region and its types of soil is given, its agricultural history outlined, and the cropping systems followed described. The most important varieties of spring wheat grown in that section are Little Club, Red Chaff, Jenkins, Early Wilbur, and Bluestem, and the most important varieties of winter wheats are Red Russian, Jones Fife, Fortyfold, and Turkey Red. Each one of these varieties is briefly noted.

The best method of summer fallowing consists in disking and harrowing in the early spring before plowing, packing the subsurface immediately after plowing, and then giving sufficient surface cultivation to retain moisture and keep the weeds under control. Where this method is practiced, the yields of wheat are about 25 per cent greater than those obtained by ordinary summer fallowing. It was observed that the use of implements for settling and packing the bottom of the plow furrow tends to increase materially the yield of all cereal crops when the land is plowed in the spring before it is sown.

It is also stated that farmers as a whole will secure better results by confining themselves to a few varieties of wheat. Little Club and Red Chaff are best adapted to humid sections and Bluestem to arid and semiarid conditions. Early Wilbur, a new wheat, is promising in the arid section because of its earliness. Of the winter wheats Turkey Red stands first for the arid and semiarid sections. When the grains are hard and horny it is a very superior milling wheat, but on account of its tendency to become starchy it may be necessary to procure seed wheat occasionally from Kansas and Nebraska. Fortyfold is adapted to the entire region, stands the winters well, and has the advantage of being early.

Dry farming in Montana, F. B. LINFIELD and A. ATKINSON (*Montana Sta. Bul. 63, pp. 32, pl. 1, figs. 8, maps 2*).—The first part of this bulletin describes the districts where dry farming promises greatest success in Montana and the second part describes the principles and practices of dry farming.

In connection with the descriptions of the different districts the rainfall of the various sections is discussed and the amount of precipitation recorded. Historical notes on dry land cropping are given and the statement is made that in any portion of the State having 14 in. of rainfall or more, and where the precipitation for the months of April, May, June, and July is 7 to 8 in. or over, dry farming properly conducted ought to be successful, but that those areas with an average of 12 in. or less of annual rainfall, and with less than 7 in. in the spring and early summer months, offer a less promising outlook.

In discussing the principles and practices of dry farming the results gained from actual tests made in the State are presented. The following cultural methods have been found of value: The formation of a deep seed bed as a soil moisture reservoir, careful packing of the soil, constant surface cultivation when possible, summer fallowing each alternate year together with summer cultivation, growing hardy strains of the different crops, growing fall and early ripening strains of spring grain, thin seeding, growing intertilled crops like corn and potatoes, as constant cultivation retains soil moisture, and occasionally growing a leguminous crop.

The average yields per acre on 5 dry farms in 1906 were as follows: Durum wheat 14.63 bu., Sixty Day oats 27.45 bu., White Hulless barley 20.86 bu., spelt 19.60 bu., spring rye 14.90 bu., fall rye 25.15 bu., flax 8.72 bu., sugar beets 5.50 tons, potatoes 95.53 bu., and corn 42 bu. As determined on 3 of the farms sowing 3 pk. per acre of spring wheat or of oats gave better yields than either 5 or 8 pk., and 3 pk. of barley gave a better yield than 5 pk.

Forage plants at the Highmore substation, 1906, W. A. WHEELER and S. BALZ (*South Dakota Sta. Bul. 101, pp. 131–153, figs. 5*).—The seasons of 1905 and 1906 were favorable to the production of large crops of corn and forage. Of the different alfalfa plants tested Nos. 162, 164, 167, and 240 have been found hardy and of high forage quality under conditions at Highmore. Nos. 162 and 167 started earlier in the spring and produced a stronger first crop than Nos. 164 and 240. These 4 numbers have been tested from 8 to 10 years and with the exception of No. 240 have gone through several generations of seed. About 20 numbers of strains grown in the breeding plats as well as in ordinary field tests are described.

It was observed in the pedigree rows of 1906 that plants from the same selection had a general tendency towards uniformity, and that some rows exhibited exceptional forage qualities as compared with plants in other rows, while other pedigree rows showed great seed-bearing tendencies. Five kinds of alfalfa sown in 1905, of which Montana, Arabian, and Turkestan survived the following winter, produced 2,860 lbs. of hay per acre. In this set Oasis and Tripoli were killed out entirely, while Arabian sustained a loss of 75 per cent through winterkilling as compared with only 5 per cent for the other 2 varieties.

Of the different varieties of millet, Kursk, introduced by this Department, appears to be as well adapted to South Dakota as any other variety tested, and some of the pedigree stocks from this source are very promising. Of the broom corn or proso millets, Voronezh or Black Turkestan and Tambov have given the best yields and appear to be well adapted to the region between the James and Missouri rivers in South Dakota and possibly west of this region. Seed of Red Orenburg and Black Voronezh grown at Highmore yielded better than seed from other sources.

The results with 16 varieties of corn under trial show that Minnesota No. 13 still leads in quality and yield, although Golden Ideal in 1906 produced 3.7 bu. more per acre than this variety. Golden Ideal, however, required 6 days longer for maturing, had a larger percentage of cob, and contained more water. Of the Dent corn varieties tested at Highmore in 1906 only Minnesota No. 13, Early White Dent from North Dakota, and Brown County Yellow Dent seem worthy of extended trial.

Notes are also given on the value of 3 sorghums tested for the past 3 years, but owing to a poor stand in 1906 no comparisons were made.

Report on the northern substations for 1906 [Field crops], E. J. DELWICHE (*Wisconsin Sta. Bul. 147, pp. 1–15, 20–24, 27–48, figs. 8*).—This bulletin contains the report on the first season's work carried on at the substations located at Ashland, Iron River, Bayfield, and Superior. The Ashland and Superior experiment farms are located on red clay, and the Iron River farm on red sandy soil typical of much of the sandy soils of northern Wisconsin. The purpose of these experiments is the introduction and examination of farm crops, the dissemination of suitable standard seeds, the determination of varieties adapted to the region, and the development of such agricultural industries and practices as are adapted to the conditions.

At Iron River, Oderbruck barley was sown at the rate of 5 pk. per acre on April 30. A crop of 26 bu. of grain per acre was threshed in September, the weight per measured bushel being 49.2 lbs. Nine pecks per acre of Swedish Select oats was sown May 1, from which a yield of 27 bu., weighing 38.6 lbs. per measured bushel, of oats of a fine quality was secured. Early Yellow Dent corn planted from June 2 to 7 was harvested the first days in October. The yield of the 2 acres first planted was 47.7 bu. of shelled corn per acre, and the total yield of green corn was 18,500 lbs. per acre.

Soy beans planted June 12 were cut for hay September 10. The yield of hay was at the rate of 3,828 lbs. per acre. A row of beans left uncut to ripen was killed by frost October 12. Kleinwanzleben sugar beets planted May 30 were harvested October 26, giving a yield of 9 tons per acre. The sugar content was 16.9 per cent and the purity 93.3 per cent. Alfalfa was sown at the rate of 25 lbs. of seed per acre on May 2. The alfalfa grew to the end of the season and stood from 6 to 7 in. high.

At Ashland, on clay soil, Oderbruck barley sown May 10 at the rate of 7 pk. of seed per acre was harvested August 10. The crop was heavy in straw, stood up well, and free from rust or smut, and the yield per acre was 22½ bu. This first plat was on fall plowing. The spring plowed plat, although better drained than the first, yielded only 10 bu. per acre. Swedish Select oats were sown May 16 and 20 at the rate of 2 bu. of seed per acre. The early sowing produced a good stand but was attacked by rust and yielded only 16 bu. per acre. The later sown oats did not reach maturity. A good patch of clover was secured with the oats as a nurse crop and a still better one with the barley. White Flint corn planted July 11 had produced fully developed ears in the milk stage by September 8 and was cut for fodder early in October.

At Superior, Swedish Select oats on a stiff red clay loam, rather mucky in the lowest places and poorly drained, produced only 9 bu. of grain of poor quality.

Potatoes were planted at Iron River on 4 different plats. The first was manured with well-rotted barnyard manure at the rate of 10 loads per acre. The second received 200 lbs. of sodium nitrate, 300 lbs. of desiccated bone, and 200 lbs. of potassium sulphate per acre. The third was left as a check, and on the fourth a crop of clover was turned under. The barnyard manure plat yielded 197 bu. 14 lbs., the commercial fertilizer plat 192 bu. 23 lbs., the check plat 174 bu. 53 lbs., and the clover plat 241 bu. 36 lbs. per acre. It was also shown that potatoes should not be raised two years in succession on the same land, and that nitrogen at present seems to be the only fertilizer element needed to produce a good crop of potatoes on these sandy soils. This type of soil seemed well adapted to the potato and clover growing is the cheapest method of supplying the soil with the needed nitrogen.

Other experiments on sandy soils with corn and potatoes seemed to show that peat in combination with rock phosphate and potassium sulphate is an effective substitute for barnyard manure. Acid phosphate apparently gave a decided increase in yield, while lime also gave an increase, but not in any marked degree. The principal needs of this type of soil are nitrogen and humus, of which peat is a cheap source. The results of experiments with green manuring crops showed that the cowpea, hairy vetch, soy bean, and crimson clover were best adapted to that kind of soil.

Notes are also given on experimental work conducted on the red clay soils with barley, oats, and corn, and with rotations and fertilizers. The effect of tile drainage was observed to be beneficial to the different crops, but with oats the effect was not so pronounced as with barley. Corn gave a better crop on tiled than on untiled land, and the best results were obtained where the tiles were placed 40 ft. apart.

Small grain crops, A. M. Ten Eyck and V. M. Shoesmith (*Kansas Sta. Bul. 144, pp. 141–193, figs. 5*).—A trial of varieties of winter wheat is described in detail. Hardy strains of durum wheats sown in fall were nearly all destroyed, while ordinary winter varieties survived the winter in good condition. Observations made in 1904 on the yield in connection with stooling showed that those varieties averaging 6 or more tillers per plant made an average yield of 28.45 bu. per acre, while those averaging less than 6 produced 21.74 bu. The varieties yielding 27 bu. or more per acre averaged 6.6 tillers per plant, while those yielding less than 27 bu. averaged 4.85 tillers per plant. In 1905 stooling apparently had little or no effect upon the yield. In 1906 varieties averaging 7 or more tillers per plant made an average yield of 43.62 bu. per acre, and those averaging less than 7 a yield of 45.51 bu. In 1904 the varieties tillering the most made the largest yields, while in 1906 the reverse took place, indicating that the yield depends upon the thickness of the stand, but that the proper thickness may vary with the season.

In 1904, 2 varieties of soft wheat gave an average yield of 27.2 bu., 15 varieties of the smooth bearded type of hard wheats 28 bu., 2 varieties of the smooth awnless type 19.8 bu., and 2 varieties of awnless velvet chaff 10.4 bu. per acre. During the 3 years the varieties of the hard red Turkey or Russian type of wheat were the best yielders. The highest average yield for the 3 seasons, 41.7 bu. per acre, was made by Bearded Fife, really a hard red Turkey wheat. Other varieties tested for 3 years and producing large average yields were Defiance, Turkey No. 4, Turkey No. 9, Malakoff, and Kharkof of the hard wheats, and Zimmerman and Fultz of the soft wheats. The 2 soft wheat varieties averaged 38.3 bu. per acre, as compared with 37.88 bu. for the 11 hard wheats tested during the same period. It is stated that the hard wheats are especialy adapted to fairly dry or upland conditions, such as obtain in the western two-thirds of the State and on the uplands in the eastern part, while the soft wheats give best results in eastern Kansas on bottom lands and in some sections on the lower uplands.

A selected strain of winter durum wheat produced 42.56 bu. per acre in 1904, as compared with 17.52 bu., the largest yield from spring durum wheat. The following year, however, only about one-tenth of the plants of this strain survived the winter.

In 1906 the best results were secured from planting wheat in furrows 2 to 2½ in. deep. Seeding winter wheat at weekly intervals from September 1 to November 3 resulted in the best yields on the plats sown September 21 and 27 and October 5. The use of 5 pk. of seed per acre gave the largest yield as compared with other quantities of seed. In previous tests, seeding 6 to 8 pk. per acre has given the best results.

A yield of 59.09 bu. per acre was secured on a ½-acre plat. This high yield is regarded as resulting from a good rotation of crops, the application of barnyard manure in moderate quantities, early plowing and frequent cultivation of the soil, seeding at a favorable time, and the use of a well-bred variety. In this same field a measured acre produced 3,497.6 lbs., or 58.3 bu. of wheat.

In a fertilizer experiment it was shown that commercial fertilizers on worn land, deficient in humus and in bad physical condition, are practically a total loss. In all fertilizer tests with small grains conducted at the station the application of barnyard manure has resulted in the largest yields. For green manuring the cowpea was found to be an excellent crop. It was found, however, that corn is a much better crop than wheat to follow cowpeas.

Wheat was grown in a 2-year rotation, being alternated with wheat, oats, flax, millet, soy beans, sorghum, Kafir corn, and corn. The value of the crops for a 4-year period was greatest when wheat was rotated with oats, and next greatest when wheat was grown continuously.

In 1904 winter barley, owing to winterkilling, gave a low yield, but in 1905 2½ acres yielded 67.86 bu. per acre. In 1906 a yield of 66.9 bu per acre was secured from a variety originally obtained from the Tennessee Station. As compared with other grains winter barley yielded nearly 75 bu. more grain per acre in the 3 years than spring barley and 40 bu. more than the best producing oats. The barley sown on September 21 and 27 gave better results than that sown either earlier or later. Seeding 2 bu. per acre produced a heavier yield than either smaller or larger quantities of seed.

Monster winter rye grown for 3 years successively gave an average yield of 37.97 bu. per acre. Ivanof winter rye, a Russian variety, appeared a little hardier and a stronger growing rye than Monster. The average yields for the 2 seasons, 1904 and 1905, were about the same.

Of the varieties of winter oats tested at the station, Winter Turf seemed more hardy than Virginia Gray, Common Gray, and Culbertson. In the fall of 1904, 2 samples of Winter Turf oats were sown, the first yielding 57.37 bu. and the second 44.05 bu. per acre, while on another field Red Texas oats yielded 71.26 bu. per acre. The following year the winter oats winterkilled very badly, only a few plants surviving. The seed from these was harvested for further planting and the selection of hardier strains. The Winter Turf oats stooled abundantly and made a rank growth of foliage.

In experiments with spring wheat Velvet Don durum wheat, as an average for 4 years, yielded 14.24 bu. per acre, while the best producing variety of winter wheat yielded 41.70 bu. The durum wheats yielded better than the common varieties of spring wheat.

The highest average yield during the 4 years' comparison of varieties of oats, which was 43.24 bu. per acre, was produced by Sixty-day, and the second highest yield, 42.11 bu. per acre, by Kherson, two of the earliest maturing varieties grown. Red Texas ranked third, with an average yield of 40.44 bu. per acre. In 1905 and 1906 the average highest yields were as follows: Red Texas 54.37 bu., Silvermine 52.18 bu., White Tartar 51.97 bu., Danish 48.03 bu., Kherson 47.27 bu., Sixty-day 46.75 bu., Minnesota No. 202 46.57 bu., and Swedish Select 45.16 bu. per acre.

During the 4 seasons' work with varieties of barley, Common Six-rowed barley made the largest average yield, 30.94 bu. per acre, Bonanza and Mansury ranking second and third, with yields of 28.97 and 28.80 bu. per acre, respectively. Beardless varieties produced smaller yields with a poorer grade of grain than varieties of the six-rowed bearded type. Hulless barley produced relatively low yields. In general, the largest yields from different rates of seeding barley and oats were secured from the use of 2½ bu. of seed grain per acre. The yields of grain on brome sod land, however, were not only larger than those produced on corn ground and alfalfa land but the largest crop was also secured from sowing 1½ bu. of seed barley per acre. The brome sod land produced nearly 25 bu. more per acre than the alfalfa land and 11.3 bu. more per acre than the corn ground. This result was largely due to the lodging of the grain where the crop followed the alfalfa and corn. In 1905 the best yield of oats, as well as of barley, was secured from seedings made March 30. In 1906 barley and oats were sown on 7 different dates from February 1 to May 11. The largest yield of barley, 36.55 bu., was produced by seeding February 1, but the largest yield of oats, 43.75 bu., was secured from the seeding made March 29. The seeding of different small grains on February 1, February 19, and at the ordinary season showed that spring wheat, emmer, and barley gave decidedly larger yields from the early or winter seeding, while oats, winter wheat, and winter rye were most satisfactory when sown at the ordinary season.

Nitrate of soda was applied at the rate of 180 lbs. per acre for oats and 210 lbs. per acre for barley. The oats lodged badly on both the fertilized and unfertilized plats. The fertilized plat produced 19.5 bu. of grain and 1,512 lbs. of straw, and the unfertilized plat 24.4 bu. of grain and 1,649 lbs. of straw per acre. The fertilized barley plat gave 20 bu. of grain and 2,234 lbs. of straw per acre, and the check plat 16.2 bu. of grain and 1,640 lbs. of straw per acre. The following year the experiment was repeated, nitrate of soda being applied to both oats and barley at the rate of 186 lbs. per acre. The fertilized plat of oats yielded 24.17 bu. of grain and 1,637 lbs. of straw, and the check plat 26.27 bu. of grain and 1,602 lbs. of straw per acre, while the fertilized barley plat produced 35.21 bu. of grain and 1,594 lbs. of straw, and the unfertilized plat 17.69 bu. of grain and 819 lbs. of straw per acre. In another series of experiments with commercial fertilizers a combination of the fertilizers gave practically no better results than the application of each on separate plats. A crop of cowpeas preceding the oat crop but not plowed under for green manure was much more effective in increasing the yield than the use of commercial fertilizers. Applying commercial fertilizers at different rates on poor upland soil proved of very little effect in increasing the crops of grain, whether applied in small or large quantities.

Spring emmer was tested for 3 years, one variety received from a Kansas seed firm giving an average yield for the 3 seasons of 28.46 bu. per acre, while another received from the North Dakota Experiment Station produced 31.35 bu. per acre. Fall seeding of emmer with the purpose of producing a winter variety proved unsuccessful. Seeding emmer at the rate of 1.87 bu. per acre through the use of an ordinary grain drill set to sow 2½ bu. of barley per acre produced the largest yield as compared with other quantities. A yield of 2,571 lbs. of spelt per acre is also recorded.

The varieties of flax producing the largest average yields in 1905 and 1906 were as follows: Common flax No. 14, 11.58 bu.; U. S. Department of Agriculture No. 9982, 10.82 bu.; North Dakota No. 155, 9.78 bu.; North Dakota No. 709, 9.15 bu. per acre. The best average yield of grain was secured by seeding at the rate of 3 pk. per acre. The thickest sown flax, 5 pk. of seed per acre, produced the largest quantity of straw, 4,723 lbs. per acre. The next largest yield, 4,633 lbs., being obtained from the plats seeded with 3 pk. per acre. A brief note on flax culture in Kansas is also given.

A preliminary progress report of cereal investigation, 1905–1907, G. W. SHAW (*California Sta. Circ. 28, pp. 4*).—The object of this work is to discover or produce such wheat as will yield the largest profit per acre and supply grain of superior milling quality, to conduct similar experiments with oats, barley, and other cereals, and to determine the effects of various methods of culture and of changes of environment upon the growth of cereals and particularly the wheat kernels.

The act passed by the State legislature to provide for the improvement of the cereal crops of California is given, and the arrangements for the work and the plan of operation are discussed. The grains introduced into California in connection with this work and not before grown in the State are listed. With the exception of corn and a very few varieties of other grains the entire list of varieties was planted at Modesto and Yuba City, the 2 field stations established for these investigations.

Cowpeas and soy beans, L. A. MOOREHOUSE (*Oklahoma Sta. Bul. 74, pp. 22, figs. 5*).—General descriptions of the cowpea and the soy bean are given and their value, especially in crop rotations, is pointed out.

Rotation experiments with these crops have been in progress at the station for several years. One rotation included corn, oats, and wheat and cowpeas, covering a period of 3 years, wheat and cowpeas being taken from the land in one season. In this test the plats receiving barnyard manure at varying intervals gave an average yield of 3.23 bu. of grain and 0.35 ton of straw per acre, while the unmanured ground gave 2.88 bu. of grain and 0.29 ton of straw as an average yield. This low yield of the cowpea crop was due to a poor stand resulting from the seed not giving a good germination. The second rotation included castor beans, Kafir corn, cotton, oats, and wheat and soy beans, the series being completed in 5 years, with crops of wheat and soy beans in the final year. The manured section received barnyard manure at the rate of 14 tons per acre in the spring of 1902, with no further application of any kind since that date. After the wheat was harvested in June, 1904, all plats were disked twice and a third disking was given about the first of July after heavy rains had fallen. The plats were seeded to soy beans on July 12 and 13 in drills 32 in. apart at the rate of about 30 lbs. of seed per acre. The unmanured plats yielded 11.6 bu. of beans and 0.68 ton of straw, and the manured plats 17.6 bu. of beans and 1.02 tons of straw per acre. This crop matured in 79 days.

In a variety test with cowpeas, conducted in 1903, Whip-poor-will produced a more vigorous growth of vines and gave a larger yield than California Black Eye. The Iron cowpea gave a heavy yield of forage but a low yield of grain. In 1904, 5 varieties of cowpeas were compared, and in this test the White Era led in yield of grain with 18.20 bu. per acre, a local variety somewhat resembling Whip-poor-will standing next with 13.59 bu. The Iron cowpea gave the maximum yield of cured hay, with a low yield of seed. California Black Eye ranked first in earliness, requiring only 112 days to mature, while the other varieties continued to grow and blossom for 142 days.

In 1904 cowpeas and soy beans were compared on bottom and on upland soil. The bottom land was seeded May 5 and the upland June 30. On the bottom land the soy beans produced 0.70 ton of hay and 9.90 bu. of grain, and the cowpeas 1.79 tons of hay and 8 bu. of grain per acre. On the upland area soy beans produced 0.61 ton of hay and 9.45 bu. of grain, and cowpeas 1.07 tons of hay and 12.45 bu. of grain per acre.

Root crops for stock feeding, S. FRASER, J. W. GILMORE, and C. F. CLARK (*New York Cornell Sta. Bul. 243, pp. 47-76, figs. 15*).—This bulletin deals with mangels, sugar beets, turnips, hybrid turnips, ruta-bagas, kohl-rabi, carrots, and parsnips, with a view to guiding those wishing to raise any of these crops under New York State conditions. The value of root crops for forage is discussed and the cultural experiments conducted for 3 years are reported.

In 1904 the crops were sown early in May and the middle of June on land part of which had been in mangels for 3 years and the remainder under a rotation of crops. The early sown mangels on the no-rotation areas were attacked by leaf spot while young. The land received about 10 tons of barnyard manure per acre, was plowed about 8 in. deep early in the spring, and harrowed 4 times. Four hundred pounds of 17 per cent available acid phosphate was sown broadcast and harrowed in. The land was rolled before sowing and the seeds put in with a hand planter. The mangels were sown at the rate of about 8 lbs. of seed per acre. Mangel and parsnip seeds were put in about ¾ in. deep and all others ½ in. deep. The mangels came up in 12 days and the cabbages, ruta-bagas, hybrid turnips, and common turnips in from 5 to 6 days. The carrot seed was slow in starting and the parsnips were a failure. The ruta-bagas were sown at the rate of 4 lbs., hybrid and common turnips rather less, and carrots at the rate of 6 to 7 lbs. per acre. The cultivation for all crops was the same. . The hand cultivator was used twice in May and the 1-horse cultivator on May 20 and every 2 weeks during June and July, and in the case of the late-sown crops until August or until the plants met in the row. Common turnips were harvested July 18 and all other roots from October 22 to 29.

Sugar beets were also grown with and without rotation on a well fitted, rich loam soil. This was replowed and fertilized with 1,000 lbs. per acre of a mixture containing 4 per cent nitrogen, 5 per cent phosphoric acid, and 10 per cent potash. In addition 1,500 lbs. per acre of air-slaked lime was applied. The seed used was of the Kleinwanzleben variety, grown at Fairfield, Wash. The seed was sown ½ to ¾ in. deep at the rate of 12 lbs. per acre. The plants were thinned 6 to 8 in., and the rows were 27 in. apart. Harvesting was begun Sept. 13 and continued weekly until Nov. 1.

In 1905 the experiment was conducted on clay loam soil in poor condition, which in 1902 and 1903 had produced oats, and in 1904 soy beans. The land was manured in the fall with from 10 to 12 tons of cow manure per acre. It was plowed 8 in. deep from May 2 to 5. It was harrowed and limed with about 1,200 lbs. of unslaked freshly burned lime per acre. The lime was slaked to a fine powder and then spread and harrowed in, after which a dressing of 240 lbs. of 12 per cent available acid phosphate, 120 lbs. of 16 per cent available dried blood, and 120 lbs. of muriate of potash was given.

In 1906 the soil used for this work was a Dunkirk clay loam which had been in corn in 1905 and in timothy for several years previous. It was plowed in the fall and limed, and manure was applied at the rate of 10 tons per acre. It was brought to a good tilth the next spring and given an application per acre of 120 lbs. of dried blood, 240 lbs. of acid phosphate, and 120 lbs. of muriate of potash. The seeds were sown on May 15 and 16. No late sowing was made, as the results of the 2 previous years were not favorable to late sowing.

A summary of the results for the 3 years is given in the following table:

Yields per acre of fresh and dry substance of different root crops.

Crops.	1904.		1905.		1906.		Average.	
	Fresh substance.	Dry substance.	Fresh substance	Dry substance.	Fresh substance.	Dry substance.	Fresh substance.	Dry substance.
	Tons.	*Pounds.*	*Tons.*	*Pounds.*	*Tons*	*Pounds*	*Tons*	*Pounds.*
Mangels	20.8	4,726	26.2	5,800	23 9	4,940	23.6	5,155
Half-sugar mangels			29.6	6,580	23.6	5,180	26.6	5,880
Sugar beets			26.9	8,120	20.7	6,060	23 8	7,090
Carrots	9.6	3,181	16.8	3,720	11 3	2,500	12.6	3,134
Ruta-bagas	17.1	3,074	25.8	4,820	26 0	5,100	23 0	4,331
Hybrid turnips	21.4	3,561	24 7	4,120	18.1	3,400	21 4	3,694
Turnips	5.6		20.9	3,380	12.1	1,980	12.9	2,680
Kohl-rabi			22.3	4,480	20.0	3,660	21.2	4,070
Cabbages	43.8	6,206	29.0	3,640	22.5	4,140	31.8	4,662
Parsnips			8.0	3,240	8.1	3,020	8.1	3,130

Sugar beets gave the highest average yield of dry matter, but the difficulty of harvesting them seems to offset this advantage. Mangels and half-sugar mangels stood next in yield of dry matter and were closely followed by ruta-bagas and cabbages. It is stated that the greatest economy would be practiced by growing cabbages, ruta-bagas, and mangels in succession for harvesting and feeding, more especially for sheep and swine. The results show that a profitable yield of stock feed may be harvested in average seasons from practically all of these crops and that a greater average yield of dry matter may be obtained from mangels, half-sugar mangels, sugar beets, and ruta-bagas than from an average yield of corn, although at not quite so low a cost. Mangels proved more succulent than sugar beets, were easier to harvest, and also kept better during storage. Turnips are considered useful for early feeding, but were found not to yield as well as the other roots and were more liable to be attacked by disease. The yields of carrots and parsnips were not sufficiently large to warrant general planting for stock feeding. Notes on harvesting, storing, and feeding roots are given.

Culture and varieties of roots for stock feeding, S. FRASER, J. W. GILMORE, and C. F. CLARK (*New York Cornell Sta. Bul. 244, pp. 79–122, figs. 29*).—This bulletin discusses the culture of roots, describes the leading varieties, and reports the experience gained with this class of crops at the station.

The number of seeds or fruits per pound of the different kinds of seed, as well as the percentage of germination, were determined, and the results are summarized in the following table:

Comparison of root crop seeds.

Crop.	Seeds or fruits per pound.	Germination.
		Per cent.
Mangels	32,000 to 185,000	73 to 185
Half-sugar mangels	24,000 to 36,000	100 to 136
Sugar beets	22,000 to 24,000	102 to 132
Ruta-bagas	161,000 to 188,000	83 to 92
Hybrid turnips	183,000 to 266,000	71 to 94
Common turnips	200,000 to 260,000	89 to 92
Kohl-rabi	114,000 to 129,000	48 to 96
Carrots	440,000 to 460,000	15 to 83

Carrot seed with a germination power of only 15 per cent was sown, and for each carrot secured over 80 seeds were required. Sowing from May 6 to 9 proved better for all roots than sowing as late as June 12. On clay loam soil carrot seed failed to grow when sown ¼ in. deep, while it grew well in sand sown ⅝ in. deep. Mangels, half-sugar mangels, and sugar beets were all sown ¾ in. deep, and all others between ¼ and ½ in.

Mangels were ready for thinning 30 to 35 days after sowing, ruta-bagas 25 to 30 days, turnips 16 to 25 days, and carrots and parsnips 35 to 40 days. An application of 100 lbs. of nitrate of soda per acre was made when the crops were found to be making insufficient growth. Common turnips, some of the hybrid turnips, and cabbages were used from the beginning of September until November, and the other crops were harvested and stored in October and early in November.

Proper rotation, early sowing, and a uniform stand are regarded as essentials for a high yield. Mangels grown continuously on the same land for 4 years yielded 9.6 tons of roots, containing 1 ton of dry matter, while on land under rotation they yielded 34 tons of roots and 4 tons of dry matter per acre. From 25,000 to 30,000 plants of mangels, ruta-bagas, and hybrid turnips, and from 40,000 to 60,000 plants of carrots per acre are suggested as a proper stand.

Two half-sugar mangels, Vilmorin Half-sugar Rosy and Carter Half-sugar, are considered suitable stock for breeding purposes. Carter Holborn Elephant, Kangaroo, and Garton Superlative ruta-bagas were found to be comparatively free from fibrous roots and of uniform and good shape. The Yellow Aberdeen hybrid turnip proved best for early fall use, while Garton Pioneer is later and can be stored as well as ruta-bagas. Mammoth Improved Green Globe and White Egg turnips were the best early varieties. Carter 100-ton carrot was the best variety for clay loam soil. Lobberich Agricultural carrot grew equally well on clay loam and gravel loam, and Giant Wiltshire and Orange Giant gave good yields on heavy clay land. Owing to difficulty in harvesting, the Giant Wiltshire and Orange Giant are better adapted to deep friable loams than to soils of a heavier nature. White Vienna and Carter Model kohl-rabi gave about equally good results.

With mangels, the average yield of dry matter per acre in the past 3 years was between 2.4 and 3 tons per acre. In 1904 the dry matter in the 9 varieties grown varied between 9.56 per cent and 16.1 per cent. Norbiton Giant was near both extremes, with 9.55 per cent in one case and 14.88 per cent in another. The sugar content for this same year varied with the 9 varieties between 4.23 per cent and 8.99 per cent. In sugar content the Norbiton Giant also showed a wide variation, although one sample ranked first.

It was also observed that mangels and sugar beets when grown continuously on the same land for 4 years were much more susceptible to leaf spot than when grown in a rotation with other crops. The results secured with 5 varieties of mangels with and without rotation showed a gain of 24 tons in total yield and of 3 tons in dry matter per acre as apparently due to rotation with other crops. In the case of sugar beets the results showed a gain of 1.9 tons in total yield or 21 per cent, and ½ ton of dry matter or 24 per cent increase per acre in favor of rotation. The increase in the dry matter was entirely in sugar, which increased 45 per cent. Data are brought together showing the composition of mangels since 1852 and pointing out that the average composition of the mangel to-day is practically the same as it was 50 years ago. Attention is called to the fact that during the past 40 years the value of the sugar beet for sugar production has been increased 50 per cent.

Alfalfa in Indiana, A. T. WIANCKO (*Indiana Sta. Bul. 122, pp. 141–154*).—The first part of this bulletin gives the results of experiments in late summer seeding, and the second part presents suggestions for beginners in alfalfa culture.

On the university farm in 1905 alfalfa was seeded August 17, a good growth was secured, and the young crop passed the winter successfully. In 1906 an effort was made to determine the practicability of late seeding by similar experiments in various parts of the State. Arrangements were made and tests were reported from 57 different farms located in 42 different counties. The reports showed good results with various dates of seeding all through the month of August. Of 38 plats sown from August 7 to 15, 34 gave satisfactory fall growth and 19 of these were in good or fair condition at the end of April. Of 19 plats sown later than August 15, 12 gave a satisfactory fall growth and 10 of these were in good or fair condition at the end of April. Of 57 reports 30 consider that the fall weather was favorable, and of the 44 reporting good stands 16 say that the fall weather was rather too dry and 5 very dry. The reports do not seem to show any relation between the date of seeding and the amount of winterkilling. Of 52 experimenters reporting on the spring condition, 23 reported less than 10 per cent of damage by winterkilling, 11 from 10 to 30 per cent, and 18 over 30 per cent. In some cases the damage was largely due to standing water and ice. There was more or less winterkilling on all types of soils, but relatively less on the lighter soil.

It is also shown that of 13 tests on pure clays all gave good or fair stands, of 38 tests on clay or clay loam soils 28 gave good or fair stands, and of 15 on sandy or sandy loam soils 14 gave good or fair stands. The preceding crop had no appreciable effect upon the results except that standing corn seemed to act unfavorably. In many cases the use of either manure or commercial fertilizers for the crop proved of considerable value. Observations on the presence of nodules and on the practice of inoculation indicated that some special form of inoculation is probably necessary in one-half of the cases where alfalfa is first introduced.

The improvement of corn, A. M. SOULE and P. O. VANATTER (*Virginia Sta. Bul. 165, pp. 91–185, figs. 48*).—The first part of this bulletin is devoted to the improvement of corn, and the second part to the basis for this improvement.

Among the best varieties of corn tested at this station are Boone County White, Cocke Prolific, Snow White Dent, Virginia Station Leaming Ear No. 37, and Virginia Golden Dent, these having made yields respectively of 78.57, 77.68, 75.89, 75.89, and 71.43 bu. per acre. Leaming is considered one of the best varieties for high elevations, and Hickory King for soils of medium fertility. The period of tasseling with the 20 varieties under test commenced July 1 and ended July 31, and the period of silking commenced July 6 and ended August 12, the number of days varying from 9 to 24. The benefits of detasseling did not pay for the labor. While varieties from the Middle West will outyield home-grown strains under proper soil conditions, they will not do so well on the comparatively thin lands of the State as the native varieties.

In 1906 a variation in yield per acre of more than 9 bu. between the best and poorest strains of Hickory King and nearly 18 bu. between similar strains of Virginia Ensilage was observed. A sample of Leaming corn from Illinois yielded 76.34 bu. and a Virginia sample 59.81 bu. per acre. Ear No. 14 from the breeding plat made a yield of 59.82 bu., Ear No. 35, 66.29 bu., and Ear No. 37, 67.84 bu. per acre. These results are pointed out to show the importance of securing the right strain.

It was found that corn developed on thin land will not yield well when first placed on rich ground. Virginia Leaming on land where cowpeas were plowed under yielded 59.81 bu., as compared with 76.34 bu. for a thoroughbred sample from Illinois. Ear No. 37, a strain improved at the station, made a yield of 64.34 bu. These results indicate that corn from the West should be put on rich land and the native corn bred up by crossing to produce corresponding yields under favorable conditions.

The application of fertilizers where cowpeas and barley or cowpeas alone were turned under was not profitable as a rule. The most profitable fertilizer application when green manure was also used was acid phosphate at the rate of 150 to 300 lbs. per acre and muriate of potash at the rate of 50 lbs. Green manuring with leguminous crops was highly beneficial, but heavy applications of fertilizers seemed advisable where vegetable matter was lacking in the soil. Where wheat stubble was plowed under in the fall 15 tons of barnyard manure gave an increase per acre of 27.91 bu. over no fertilizer, at a cost of 21 cts. per bu., 300 lbs. of cotton-seed meal an increase of 31.93 bu. at a cost of 14 cts., acid phosphate at the rate of 150 or 300 lbs. an increase of 9.16 and 18.33 bu., respectively, at a cost of 10 cts., Thomas slag at the same rates, of 10.54 and 14.99 bu. at a cost of 13 and 18 cts., respectively, floats at the rate of 300 lbs., of 5.59 bu. at a cost of 18 cts., muriate of potash, of 16.75 bu. at a cost of 6 cts., and a complete fertilizer at the rate of 100 lbs. nitrate of soda, 300 lbs. of acid phosphate, and 50 lbs. of muriate of potash made an increase of 16.30 bu. at a cost of 33 cts. per bu.

The necessity and possibility of improving corn is shown by the fact that the yield from 40 samples tested varied from 28.14 to 57.26 bu. per acre in 1905, and from 34.79 to 81.69 bu. in 1906. The effect of cross-pollinating native varieties with western strains is shown in Ear No. 23, which yielded 47.73 bu. in 1905 and 79.46 bu. in 1906, and in Ear No. 35, which yielded 54.94 bu. in 1905 and 81.69 bu. in 1906. The effect of cross-pollination was further shown by the fact that the lowest yield from Illinois seed in 1905 was 26 bu. and the highest 53 bu., while in 1906 the lowest was 42 bu. and the highest 68 bu. In 1905 the lowest yield of the Virginia sample was 39 bu. and the highest yield 57 bu., while in 1906 the corresponding yields were 52 and 81 bu. A Virginia sample of Boone County White after cowpeas plowed under made 84.53 bu., after 15 tons of barnyard manure 73.21 bu., and after timothy and clover sod 79.46 bu., while the Illinois sample yielded 58.92 bu. after cowpeas, 76 bu. after manure, and 67.86 bu. after timothy and clover sod. The fact that the Virginia seed germinated more vigorously and the plants grew better than the other strain is taken as pointing out the relation of acclimatization to yield.

Large ears selected from different samples of known history gave in every instance a more vigorous germination and higher yield than small ears similarly selected. In some instances the difference in yield amounted to nearly 11 bu. per acre. Corn stored in the crib showed a very poor germination as compared with corn stored in a dry room and on racks in the barn. The average per cent of protein in the native ears of Leaming corn in 1906 was 10.30 and in the Illinois ears 10.68. Many of the best yielding ears did not contain as high per cent of protein as the undesirable ones, thus indicating the necessity of not basing selection on a high protein content alone.

Sugar beet experiments during 1906, F. W. WOLL and C. W. STODDART (*Wisconsin Sta. Bul. 150, pp. 45, figs. 4*).—Experiments were conducted on 10 different farms with soils ranging from light sandy loams to heavy clays. The object of the work was to study the adaptability of types of Grant and Vernon county soils to sugar beet culture, and to investigate the system of fertilization that would produce the best results for factory purposes. A 1-acre field of sugar beets was grown on each of the 10 farms under different systems of fertilization. These fields were divided into 7 plats, Nos. 1 and 7 of which received no fertilizers; 2, 180 lbs. of potassium sulphate per acre; 3, 420 lbs. of 14-per cent acid phosphate; 4, these quantities of potassium sulphate and acid phosphate combined; 5, the same application as 4 with 300 lbs. per acre of nitrate of soda in addition, and 6, 10 tons of barnyard manure calculated to contain approximately the same amounts of fertilizer ingredients as the application on plat 5. Lime was applied at the rates of ½ and 1 ton per acre.

The results of this one season's work show that sugar beets as rich in sugar and high in purity can be produced in the southwestern part as elsewhere in the State. The general averages for the beets grown in that region were 15.49 per cent sugar and 91.6 per cent purity.

In all cases but one the largest yields of beets and of sugar were obtained on the plats receiving a complete fertilizer, with barnyard manure standing next as the cheapest application. Lime applied at the rate of 1,000 lbs. per acre produced a beneficial effect on a number of fields, and in one instance a heavy clay soil required a double application to increase the yield of beets and sugar. The results secured at each of the different farms are presented in tables.

HORTICULTURE.

Report on the Northern Substations for 1906. Horticulture, E. J. DELWICHE (*Wisconsin Sta. Bul. 147, pp. 15–20*).—The horticultural work at the Northern Substations is planned along 3 principal lines: Orchard work with regard to the adaptability of different kinds of fruit trees to the soil and climate and the development of methods of cultivation best suited to northern Wisconsin conditions, experiments with small fruits, and demonstrations and experimental work with potatoes and garden vegetables. As previously noted (E. S. R., 18, p. 1049), investigations were conducted to determine the possibility of fruit culture in the Lake Superior region of Wisconsin during 1906, as a result of which 3 trial orchards were established.

The orchard work for the first season is here reported, including a description of the site, a list of the varieties of fruit grown, and notes on the first year's growth. Plums, cherries, and apples were planted and as a whole the results for the season were satisfactory, although many of the cherry trees died. The failure of the latter trees to succeed is believed to be due partly to the trees being too far along when planted and partly to their being planted on wet ground. The work with potatoes is elsewhere noted.

Varieties of vegetables grown at the Xieng-Khouang experimental station in 1905, PIDANCE (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 60, pp. 150–159*).—A brief account is given of the cultural methods employed at the station, together with notes on a large number of vegetables, and small and tree fruits grown.

The parthenocarpie or virgin fruitfulness of fruit trees, R. EWERT (*Die Parthenocarpie oder Jungfernfrüchtigkeit der Obstbäume. Berlin: Paul Parey, 1907, pp. 57, figs. 18*).—The author's experiments in the determination of the relation of the productiveness of apples to the biology of the flowers were continued during the season of 1906. Previous results (E. S. R., 17, p. 1156) were corroborated, in addition to which a new phase in orchard culture is advanced, viz, the development of fruit without fertilization or "parthenocarpie."

In the present work the author describes his method of procedure, together with the experiments conducted in the artificial production of seedless fruit, both in the greenhouse and on trees growing out of doors. Although he has succeeded in producing seedless apples and pears of the size and quality of normal fruit, the hard cores are still present.

The planting of varieties showing a tendency to produce seedless fruit is believed to be advisable so that the supply of fruit may be maintained even when, for some reason or other, cross-fertilization has not taken place.

Report on the results obtained from the summer pruning of fruit trees (*Gard. Chron., 3. ser., 41 (1907), No. 1069, pp. 400–403; 406, 407*).—In order to obtain a large number of opinions with regard to the practice of summer pruning, the *Gardners' Chronicle* recently sent out a list of questions on the subject to correspondents interested in fruit culture in different parts of Great Britain and Ireland. The information thus secured is presented in tabular form.

With respect to the date of pruning, it appears that some operators commence in June and others as late as August, but the great majority in July. Plums are generally treated before apples and pears. More than 150 report satisfactory results from summer pruning, while only 35 express doubts as to the value of the practice. The results as tabulated are discussed editorially, and reference is made to the experiments conducted on the Duke of Bedford's experimental fruit farm, as noted below, which have not been favorable to summer pruning.

Seventh report of the Woburn Experimental Fruit Farm, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt., 7 (1907), pp. 56, pls. 4*).—This report deals with the results of pruning experiments, chiefly on apple trees, of which records have been kept for the last 12 years. The problems considered include the effect of branch pruning on growth and crop, summer pruning, cutting back transplanted, injured, or ailing trees, and the pruning of older trees. The results secured prior to 1905, based on the measurements of tree height, spread of the branches, and diameter of the stems, have been reported and noted (E. S. R., 17, p. 559).

In 1905 more than half the trees were dug up and weighed, and the tree-weights appear to more than substantiate the previous tree measurements in proving that the less a tree is pruned the larger and heavier it becomes. The details of the investigations are explained and discussed at length, and the results, together with the authors' conclusions, are summarized.

The main series of experiments were conducted chiefly on dwarf apple trees on paradise stock, with three varieties possessing very different habits of growth. At the end of 12 years those not pruned at all were 20 per cent heavier than those which were moderately pruned, whereas the hard-pruned trees were 16 per cent lighter. Since the difference in weight between the unpruned and moderately pruned trees is greatly in excess of the wood removed by pruning, it is concluded that pruning does not increase the actual size of the tree, but even results in less new wood being formed. When similar branches on the same tree were pruned to different extents it was found that the less the pruning the greater the number, length, and weight of new shoots formed and the increase in girth of the original branch.

The reduction in pruning appears more marked as regards the crop. With the dwarf apple trees, during the first 5 years, the crops from the unpruned trees were more than twice as great as from those moderately pruned, and more than three times as great as from those hard pruned. These differences were increased during the second period of 5 years, and at the end of the twelfth year the unpruned trees yielded nearly three times as much as the moderately pruned ones, while the hard-pruned trees had practically no crop at all. (Only 1 variety was in fruit for comparison during the twelfth year.)

Similar results were obtained in 1906 with trees of 53 and 80 varieties of the crab and paradise stocks, respectively. The trees were not allowed to overbear and it is claimed that the size of fruit obtained from trees pruned to different extents was approximately the same, hence the values of the crops were proportional to the weights. Confirmatory evidence of the antagonism of pruning to fruiting was obtained by counting the fruit-buds formed on similar branches of the same tree, which were cut back to different extents. All of the above results refer to healthy, vigorous, growing trees.

With the dwarf apple trees (15 years old) the authors find that hard pruning now results in an increase of the new wood formed, but that the crops are even more reduced by the pruning than in former years. This result is said to apply also to trees which have become stunted, as from root injury in transplanting.

Since hard pruning has been shown to be the correction for fruiting, it is concluded that freshly planted trees should be cut back hard to prevent stunting by precocious fruiting. With trees which were not cut back until the end of the first season the average size of the leaf was 24 per cent less and the new wood formed 45 per cent less than with similar trees cut back when planted. The ultimate result was found to be that trees not cut back until the end of the first year continued to form wood in subsequent years and the crop borne by them during the first 10 years was only one-third of that borne by those which were cut back when planted.

Experiments on apples, pears, and plums show that the date of cutting back a freshly planted tree is immaterial, providing it is done before growth begins. If delayed until after the growth is well started the season's growth is much reduced. This point was investigated with older, slightly stunted plum trees. The results were the same when the lopping was done during the dormant period. Lopping toward the end of May, or a few weeks after growth started, resulted in a less growth during the year, which was more than compensated by an additional growth during the succeeding season. Summer pruning, however, appears to be unfavorable for wood production.

While it appears to be established from these experiments that the crops are larger and the growth of the tree is greater in proportion as the pruning is reduced, the authors are of the opinion that another series of experiments might demonstrate that a certain amount of pruning may be good and even lead to better results than those obtained from their work, especially with certain varieties of apples which differ largely in their habits and require different treatment. The general conclusions reached are that prunings should be reduced to the lowest possible limits consistent with the formation of a tree of sufficient sturdiness to bear its crops with safety, which in most cases, would mean besides the cutting back after planting a gradually reduced pruning for the first four or five years. Pruning after this time should consist merely in the removal of interfering branches and unripened wood. With precocious varieties or very weak growers the pruning should be greater or continued longer. More pruning is required with standard than with dwarf trees, since with the standard it is desirable to produce a compact head before heavy crop production begins.

Atlas of fruits, A. S. GREBNITSKI ET AL. (*Atlas Plodov. St. Petersburg: Imp. Russ. Soc. Fruit Cult., 1903, vol. 1, pp. XXIII+158; 1904, vol. 2, pp. IV+159–308; 1905, vol. 3, pp IV+309–429; 1906, vol. 4, pp. 430–589, pls. 100*).—This work consists of colored illustrations, drawings, and pomological descriptions of over 100 of the best or most widely distributed commercial varieties of apples, pears, and drupaceous fruits in Russia.—P. FIREMAN.

Lists of fruits recommended for culture in Wisconsin (*Ann. Rpt. Wis. Hort. Soc., 37 (1907), pp. XX–XXII*).—Provisional lists, prepared by the trial orchard committee of the State horticultural society, are here given of all of the important orchard and bush fruits recommended for planting in Wisconsin. In the selection of these varieties particular attention has been paid to the hardiness of plant and fruit bud.

Cooperation in the marketing of apples, A. MCNEILL (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 18, pp. 28*).—This bulletin contains a brief account of the origin and progress of apple growing in Canada and the varying conditions of the market for Canadian apples during the past 40 years, together with the history of cooperative associations in Canada, and a discussion of all the important features of the systems now in use. A list is also given of the cooperative associations of Ontario and British Columbia in successful operation during the season of 1906, together with the text of the constitution and by-laws of typical organizations.

Etherization of strawberries (*Gard. Chron., 3. ser., 41 (1907), No. 1063, p. 302*).—Brief mention is made of the work of M. Bultel[a] in forcing strawberries with ether, in which it was shown "that strawberries previously subjected to etherization not only flowered and fruited earlier but also bore a larger yield of fruit than others."

Judging from his experiments, M. Bultel is of the opinion that plants etherized for early fruit production give as satisfactory results as plants which are etherized for the production of early flowers.

The viticultural experiment station of Juazeiro, J. SILVEIRA (*Bol. Dir. Agr. Bahia, 8 (1906), Nos. 5, pp. 504–508; 6, pp. 586–592*).—The author gives a general account of the organization of the station, together with an outline of the work, which consists principally of variety tests of a large number of grapes, although attention is also paid to many other crops.

Report presented to the viticultural society of Lyon by the committee on hybrid direct-bearers for 1906, E. DURAND (*Vigne Amér., 31 (1907), No. 5, pp. 141–157*).—In this report some general considerations are given on the subject of grape hybridizing, together with a descriptive list of the hybrid direct-bearers considered by the committee to be of the most value for planting in France.

Recent observations on the hybrid direct-bearers in the Valley of the Rhone, A. DESMOULINS and V. VILLARD (*Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), Nos. 23, pp. 679–690; 24, pp. 719–724; 25, pp. 738–741*).—Observations have been made for the past 7 years on a large number of hybrid direct-bearers in vineyards of the Rhone Valley, and are here presented in tabular form, including the varieties, color of the fruit, period of maturity, vigor and degree of ripeness of the shoots, resistance to phylloxera, fungus diseases, and drought, together with brief notes on each variety.

Tabulated data are also given on studies made of the fruits and must from each variety, and the hybrids considered most valuable for the reconstitution of vineyards are discussed with regard to their hardiness, productiveness, resistance to phylloxera, mildew, etc., and the content of the wine made of the must in alcohol and sulphuric acid.

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[a] Jour. Soc. Nat. Hort. France, 7 (1906), pp. 27, 191.

Fertilizer experiments with grapes at Graves [France], H. Verdié (*Rev. Vit., 27* (*1907*), *No. 704, pp. 657–660*).—This is a preliminary report on experiments conducted for the past 3 years to determine an economic fertilizer for the grape region of Graves. The ingredients used were in the following proportions: Dried blood 100 kg., sulphate of potash 200 kg., basic slag 800 kg., plaster 400 kg. The total cost of this fertilizer was computed as 137 francs ($26.44). Nine plats were used in the experiment, including the check plat, and this formula was varied on different plats by the omission of one or more elements. The soil in this region is sandy and noncalcareous.

A table is given showing the nature of the fertilizers used in each plat, the weight of 100 fruits, the percentage of skins, seeds, pulp, and juice, the weight of dry matter for 100 gm. of fresh berries, and the percentage of phosphoric acid and soluble potash. Another table shows the richness of the must of grapes from the various plats in grams of sugar and sulphuric acid per liter.

From these experiments the author concludes that growers are warranted in using chemical fertilizers in the manuring of vines for the production of high-grade wines. Although nitrogen increased the vigor of the vines, where the amount used was large the quality of the must appeared to be less rich than in plats where the nitrogen content was small. It is believed that potash has a decided influence on the quality of the fruit and must. To secure the best results the author recommends the use of the complete formula employed in the experiment, including the lime.

Cold storage of grape vines, E. H. Pratt (*Fruit Grower, 18* (*1907*), *No. 7, p. 3*).—A brief summary is given of the author's report at the meeting of the American Association of Nurserymen at Detroit as to an experiment conducted to test the value of cold storage for carrying nursery stock over from one season to the next.

In October, 1900, some grape vines were dug and placed in the ordinary storage house, where they remained all winter. On June 7, 1901, 3 boxes of these vines were placed in cold storage, 2 of which were kept at a temperature of 33° to 34° and the other at a temperature of 28°. In the latter part of September, after having been in cold storage 3 months and 19 days, the vines were replaced in the nursery storage house and carried over until the spring of 1902. A portion were then used in filling orders in March, 1902, but in order to test the value of the vines about 1,200 were retained by the firm and planted late in the following May. They grew well and were dug in the fall of 1902 and used in filling orders. The test appears to have been successful in every way. Further successful efforts in the cold storage of nursery stock have been noted (E. S. R., 17, p. 467).

Cold storage, G. H. McKay (*Proc. N. J. Hort. Soc., 32* (*1907*), *pp. 127–135*).—In this paper the author discusses conditions which should be observed in putting fruit in cold storage. In respect to the Kieffer pear it is stated that this fruit will stand a temperature of 32° F., and it is believed that much of the disrepute into which this pear has fallen is due to its having formerly been stored at a considerably higher temperature.

Considerable comparative data are also given with reference to the profits derived from the cold storage of fruit.

Cool storage and fruit fly (*Jour. Dept. Agr. West. Aust., 15* (*1907*), *No. 4, pp. 252, 253*).—A brief account, with tabular data, is given with regard to experiments conducted by T. Hooper on the destruction of the fruit fly maggot in fruit by means of cold storage. In previous experiments along this line, the manager of the refrigerating works of the Western Australian government had found that these maggots lived to resist temperatures of 44° to 38° F.; hence in the present experiments the wormy fruit tested was subjected to a temperature averaging from 33° to 35°. When taken out and examined, the eggs appeared fresh, but when subjected to ordinary temperature they failed to hatch out and shriveled up after a few days.

In the data obtained from this experiment 15 days was found to be the limit at which the maggot or eggs lived, although to insure perfect safety it is recommended that wormy fruit be submitted to cold storage at the above temperature for 3 weeks.

Formosa tea industry, J. H. Arnold (*Mo. Consular and Trade Rpts.* [*U. S.*], *1907, No. 321, pp. 149, 150*).—In this abstract of the author's report on the Formosa tea industry the exports of tea from Formosa during 1906 are given as 21,992,145 lbs., with an approximate value of $3,500,000, of which the United States took 17,159,310 lbs. as compared with 18,061,911 lbs. in 1905.

A tea expert has been endeavoring to show the Chinese growers the value of fertilizers in increasing the productivity of the crop without injuring the flavor of the tea. Utilization of the inferior leaves, whch were at one time a loss to the dealers, is recommended in the manufacture of pouchong and black teas. Pouchong tea is described as an oolong, scented with the flowers of jasmine, gardenia, etc., and has an extensive sale among the Chinese population in the Straits Settlements, the Philippines, Hawaii, and some parts of the United States. In 1906, 4,300,000 lbs. of pouchong tea was exported from Formosa, about one-half of which was produced on the island. An attempt is now being made to secure a market in Turkey and Russia for brick and black teas of Formosa manufacture, in the making of which it is hoped to utilize the tea dust which at present finds no market.

Pruning coffee trees, E. J. Nuñez (*Bol. Agr.* [*San Salvador*], 7 (*1907*), *No. 3, pp. 108–119, figs. 8*).—This article contains general considerations with regard to the principles and advantages of pruning, with a special discussion on the pruning of coffee trees.

Turkish hazelnut growing, M. A. Jewett (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2908, pp. 11, 12*).—The author gives a brief description of hazelnut (filbert) production in the province of Trebizond, Asia Minor. It is estimated that 400,000 acres of land on the hillsides along the south shore of the Black Sea and extending 10 to 15 miles inland are devoted to filbert culture.

The young trees begin to bear at the end of the fourth or fifth year and are said to be at their best when 7 or 8 years old. The orchards are renewed at the end of 15 to 20 years' time. The nuts are harvested in July and August and dried and sorted to some extent before being brought to the market. There are 3 varieties grown—the round, pointed, and almond—of which the round nuts are most abundant and furnish the basis for prices. The "almond" filberts, while few, are of high quality and sell for 30 per cent more than the round. The pointed nuts are shipped in the shell and cost 10 per cent more than the round. The round nuts, which form the bulk of the crop, are usually shelled before being exported, since shelling effects a saving of about 50 per cent on the freight. The shells are used for fuel and a small quantity are shipped to Europe, where they are said to be used in adulterating spices.

The nuts are sometimes bleached by fumigation before they are exported. However, while this practice improves the color, it is said to injure the flavor and the keeping quality of the nuts and is not considered a beneficial practice. The total exports for 1906 were 80,000 cwt. of nuts in the shell and 85,000 cwt. shelled, of which 6,340 cwt., practically all shelled, valued at $63,834, were sent direct to the United States.

Hardy trees, shrubs, and vines suitable for planting in Oklahoma, O. M. MORRIS (*Oklahoma Sta. Bul. 73, pp. 6*).—This bulletin is a brief report on variety testing of trees and shrubs desirable for planting for timber, home adornment, and ornamentation of public parks. Descriptions are given of several trees recommended for general planting, together with notes on their economic value. Several lists are also given of hardy and tender trees and shrubs, useful native plants, hedge plants, and hardy vines and roses.

All the native shrubs worth planting, J. TIPLADY (*Ann. Rpt. Wis. Hort. Soc., 37 (1907), pp. 25–31, pls. 3*).—The author has compiled a list giving the common and botanical names of native shrubs best adapted to different locations and conditions in Wisconsin. The varieties are grouped together with reference to their size and adaptability to light and shade and to different degrees of soil moisture and fertility.

FORESTRY.

The use of the national forests (*U. S. Dept. Agr., Forest Serv., 1907, pp. 42, pls. 6*).—The object of this publication is to explain the true purpose and use of the national forests, "what they mean, what they are for, and how to use them." The forests are considered in regard to their value to the home seeker, prospector and miner, users of timber, range, and water, and to taxpayers and others. The methods of protecting the national forests by the Forest Service are discussed at length. In the appendix is given the text of the agricultural settlement act of June 11, 1906, together with the name and location, date of latest proclamation, and area of each national forest in the United States, Alaska, and Porto Rico. The grand total of 153 national forests comprises 147,948,685 acres.

Suggestions for forest planting in the Northeastern and Lake States (*U. S. Dept. Agr., Forest Serv. Circ. 100, pp. 15, fig. 1*).—Popular suggestions are given for the reafforestation of cut-over lands, worn-out agricultural lands, sand dunes, and barrens, together with the development of watershed protection and woodlots, including brief cultural notes and species recommended for planting. The suggestions contained herein are said to apply to the New England States, New York, New Jersey, Pennsylvania (except the western portion), Michigan, Wisconsin, and eastern Minnesota.

Suggestions for forest planting on the semiarid plains (*U. S. Dept. Agr., Forest Serv. Circ. 99, pp. 15*).—The suggestions contained in this circular are intended to apply to the western portions of Kansas, Nebraska, and Oklahoma, northwestern Texas, eastern Colorado, and eastern New Mexico, in which region the distribution of the rainfall is uneven and wide areas often suffer from prolonged drought. Some general considerations are given with regard to the advisability of tree planting for protective purposes, woodlots, and shade trees, together with suggestions as to methods of planting, cultivation, and care, and a list of trees recommended for planting in this area, including the Russian mulberry, Osage orange, green ash, black locust, honey locust, cottonwood, white elm, hackberry, hardy catalpa, boxelder, red cedar, and several species of pines.

Notes are also given with regard to the soil and climatic requirements, general characteristics, planting distances, and uses of the species mentioned.

Report of the superintendent of forestry, R. S. HOSMER (*Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 3 (1906), pp. 15–66, maps 4*).—This is a report of the work of the division of forestry for 1906, and embraces a discussion of forest reserves, forest extension, and miscellaneous forest work. The forest fire service and progress of forestry in the Territory are also considered, together with future plans and recommendations for the betterment of the work.

During the year 7 new forest reserves have been established, with an aggregate area of 126,825 acres, of which 62,425 acres have been actually set apart. The total number of forest reserves is now 12, with a combined area of 337,147 acres, of which 117,532 acres of unleased government land has been actually set apart.

Tabular data are given showing the area of leased, unleased, and private forest reserves in the islands of Kauai, Oahu, Maui, and Hawaii, together with maps showing the location of the 12 reserves established on these islands. A record is also given of the year's fires on the islands of Hawaii, Oahu, and Kauai.

The division of forestry has undertaken 3 kinds of rubber experiments. A systematic trial of Ceará rubber (*Manihot glaziovii*) has been made in various localities throughout the territory to ascertain definitely where this species will grow. The importation of seed or seedlings of other rubber-producing trees, together with their propagation and distribution, and systematic experiments in tapping rubber trees that have reached sufficient size for this purpose are also discussed.

Progress report of forest administration in the province of eastern Bengal and Assam for the year 1905–6, W. F. L. TOTTENHAM (*Rpt. Forest Admin. East. Bengal and Assam, 1905–6, pp. 62, map 1*).—This is the annual report in regard to the constitution, management, protection, sylviculture, exploitation, and financial results of the State forests of eastern Bengal and Assam for the fiscal year 1905–6. All the important phases of the work are presented in tabular form.

During the year 17,206 acres were added to the reserve forests, making the present total area 3,841,820 acres. The gross revenues amounted to 1,254,787 rupees ($602,297.76) and the expenditures to 675,863 rupees ($324,414.24).

There are 4 rubber plantations aggregating 2,928 acres scattered through the province, of which the most important is at Charduar, where 2,746 acres of *Ficus elastica* have been planted out. The net revenue of the year from the rubber plantations is given as 23,381 rupees ($11,222.88) and the commercial value of the undertaking appears to be established. The text is accompanied with a map, showing the forest areas in this province.

Notes on western [Australian] timbers, R. J. DALTON (*Agr. Gaz. N. S. Wales, 18 (1907), No. 2, pp. 143–145, fig. 1*).—A list is given of 16 kinds of timber found in western Australia, with notes on the uses of each.

The silva of Colorado. I. Trees of the pine family in Colorado, F. RAMALEY (*Univ. Colo. Studies, 4 (1907), No. 2, pp. 109–122, pl. 1, fig. 1*).—This is the first of a series of papers to be published with respect to the trees and shrubs of Colorado. The present paper deals with the pine family in that State, including the pines, spruces, and firs. General considerations are given with regard to the economic and other values of forests, together with a list of books dealing with the trees of Colorado, and keys with descriptions of the genera and species of the pine family in this State.

The uses of beech wood, H. ZOLIKOFFER (*Ann. Gembloux, 17 (1907), No. 5, pp. 264–279*).—An account is given of the mechanical and physical properties of beech wood, together with its use for railway ties, construction purposes, manufacture of carriages, furniture, etc., as well as its value for firewood and the manufacture of charcoal.

With reference to its use for railway ties as compared with oak the following illustration is given: A section of 808 oak ties on the railroad between Paris and Strassburg was examined at the end of about 12 years, during which period 128,000 trains had passed over them. Of the total number of ties 178, or 22 per cent, were found still intact, 275, or 34 per cent, were found passable, and 355, or 44 per cent, were found poor. On the line between Paris and Mülhouse a section of 224 beech ties was examined at the end of 14 years, during which time 109,000 trains had passed over them. Of the total number of ties 216 were good, 7 passable, and one alone was poor. Beech ties, however, are liable to split and should be bolted at the end.

Production of red cedar for pencil wood, L. L. WHITE (*U. S. Dept. Agr., Forest Serv. Circ. 102, pp. 19*).—The number of pencils manufactured in the United States each year is given as something like 315,000,000, for the production of which 300 tons, or 20,000 cu. ft. of wood are required daily, the greater part of which is red cedar.

In order to devise some method by which a future supply of cedar might be secured a study was made in Florida, Alabama, and Tennessee, where conditions are believed to be typical for cedar production. This circular contains the results of these studies, in which 2 species of red cedar are dealt with, the southern form (*Juniperus barbadensis*) and the northern from (*J. virginiana*). Among the phases considered are the commercial range, silvical characteristics, methods of reproduction, present logging methods, and future management. Two systems of management are discussed: "Woodlot management" to meet the needs of the small timberland owners, and "management of large holdings" for the use of pencil manufacturers in the position to grow their own timber.

The text is accompanied with a planting plan and several tables regarding the relation of diameter and crown width to age, the number of feet, total volume, and percentage of heartwood in the used length, and the clear length and total height at different diameters of forest-grown and open-grown cedar. Data are also given in regard to the cost, yields, and financial returns of red cedar plantations.

In order to have a constant supply of cedar on a 60-year rotation, it is estimated that about 225,000 acres should be fully stocked, and it is suggested that companies interested in this work purchase large holdings of suitable cedar land and manage the tract on a basis of a sustained annual yield.

The Douglas fir since its introduction into Europe (1828–1906), J. BOOTH (*Allg. Forst u. Jagd Ztg., 83 (1907), Jan., pp. 5–10; Feb., pp. 45–50; Mar., pp. 87–93; Apr., pp. 113–118*).—This is an historical account of the cultivation of the Douglas fir in Europe from its introduction in 1826 up to 1906.

Acacia macrocarpa, with respect to its production of tannin, G. BARBION (*Bul. Soc. Hort. Tunisie, 6 (1907), No. 25, pp. 79, 80*).—An account is given of the *Acacia macrocarpa* which has been cultivated for several years at the Tunis experimental garden. The trees when pruned are used for hedges and are said to yield a fusiform fruit from 6 to 10 cm. in length and weighing from 5 to 10 gm. when dried.

Upon analyzing these fruits, the director of the agricultural chemistry laboratory found the scales, which composed 52 per cent of the fruit, to contain 14 per cent of tannic acid, or practically the same amount as is obtained from rich tannic barks. The tannin has given satisfactory results when used on fresh hides and is to be further tested by commercial leather manufacturers.

The eucalyptus, A. ROYER (*Bul. Soc. Hort. Tunisie, 5 (1906), Nos. 22, pp. 207–216; 23, pp. 271–277; 6 (1907), 24, pp. 52–56; 25, pp. 95–99*).—This is a monograph on the eucalyptus tree, including a general consideration of the genus as a whole, botanical descriptions, history, discovery, and propagation, geographical distribution, classification of species according to soils and climate, important uses, and acclimatization in North Africa, together with its uses, properties, products, and defects, and a description of some of the better species growing in North Africa, including characteristics, soil, climate, cultivation, and uses.

The work concludes with directions for the culture of the eucalyptus, embracing sowing, nursery practices, shading, hybridizing, and selection. The author is of the opinion that the introduction and culture of the eucalyptus in Mediterranean Africa is one of the most remarkable and useful agricultural experiments of the past century.

Tapping Funtumia rubber, H. H. Bell (*Agr. News [Barbados], 6 (1907), No. 127, p. 77*).—The writer gives an account of the tapping of *Funtumia elastica*," or "Lagos silk rubber" in the Budonga forest in Uganda, Africa, together with a description of the treatment of the latex. The trees are tapped every 3 months on different sides of the trunk. The average yield of the latex at each tapping is given as about 1 qt. per tree, with an annual average yield of 1 lb. of pure rubber. The process of coagulation is described. It is stated that a considerable quantity of Funtumia has been planted in the West Indies in the last 2 or 3 years. Rubber from this tree is now selling in London at 5s. 6d. per pound, a price almost equaling that obtained for the best Para rubber.

The valuation of rubber, M. Calmon (*Bol. Dir. Agr. Bahia, 9 (1907), Nos. 1, pp. 1–32; 2, pp. 117–154*).—This is a report of the commissioner of agriculture and industry on the production and commercial importance of rubber, including an account of the development of the industry in all of the important rubber-producing countries and a large number of statistics taken from various sources with respect to the exploitation, the imports and exports of crude rubber, and the commerce in articles made of rubber in the various rubber-consuming countries.

The open-tank method for the treatment of timber, C. G. Crawford (*U. S. Dept. Agr., Forest Serv. Circ. 101, pp. 15, figs. 4*).—This method of treating timber was originated by the Forest Service as a result of experiments conducted to obtain some cheap and simple process of wood preservation adapted for timber in common use for which the pressure methods are too expensive. In this circular consideration is given to the history, description, theory, and methods employed in the open-tank process, with its application and limitations. Descriptions follow of the necessary apparatus, together with diagrams of experimental tanks for treating fence posts, telephone poles, and mine timbers, as well as a diagram of a small commercial plant.

The open-tank method is based upon the use of an open tank, capable of withstanding heat, and either equipped with steam coils or so arranged that a fire can be placed underneath. Extensive experiments by the Forest Service with fence posts, telephone poles, and mine timbers have given satisfactory results, and it is believed that any of the preservatives in general use can be applied by the open-tank method for the treatment of fence posts, telephone poles, mine props, small dimension timber, cross-ties, piling, and similar timbers, provided that the temperatures are properly controlled.

DISEASES OF PLANTS.

Report of the biological division, F. L. Stevens (*North Carolina Sta. Rpt. 1905, pp. 20–29*).—A summary is given of the investigations carried on by the biologist of the station during the period covered by the report, the principal observations being on the disease of tobacco known as Granville wilt. Among the miscellaneous notes, accounts are given of the asparagus rust, which has become quite destructive in portions of North Carolina and for which sulphur applications are recommended; the powdery mildew of the rose, to prevent which spraying with potassium sulphid is advised; a disease of sweet potatoes, due to *Fusarium* sp., which results in a wilt of the plants; and a disease of apples, to which the name apple scurf is given. This apple disease is of fungus origin, although the species has not been determined. It affects the bark, causing the appearance well described by the name given, and the characteristic malformations have been repeatedly formed through inoculation experiments.

The tobacco wilt is said to be the most important of the diseases under investigation, and for its control the author has conducted experiments in soil treatment as well as in the breeding of resistant races. A large number of chemical substances were used in attempts to destroy the fungus in the soil, without results that would be considered satisfactory in ordinary use. During the progress of these investigations the susceptibility of a considerable number of plants to this fungus was tested, and it was found that Irish potatoes and tomatoes were subject to a disease which in all appearances was like the tobacco wilt. Specimens of eggplant and peppers were similarly affected, but the identity of the diseases on these plants with tobacco wilt is not fully established. Experiments with the electric current for sterilizing the soil were undertaken without beneficial results. The most promising means of overcoming the Granville tobacco wilt is believed to be in the breeding and selection of resistant varieties or races. A considerable number of these have been experimented with and marked differences in susceptibility to disease are noted.

Notes on the watermelon wilt, and a brief account of experiments in breeding by selection and hybridization for resistant varieties are given. These latter experiments were in cooperation with the Bureau of Plant Industry of this Department.

The root-rot fungus, M. C. Cooke (*Gard. Chron., 3. ser., 41 (1907), No. 1067, p. 361, fig. 1*).—Attention is directed to a disease due to *Thielavia basicola*, which attacks indiscriminately a great variety of cultivated plants, the account being largely drawn from the report of the Connecticut State Station for 1906 (E. S. R., 18, p. 1138). According to the author this fungus has been reported on peas, horse-radish, cyclamen, lupines, tobacco, sainfoin, senecio, violets, aralia, and nemophila. It is shown that the fungus, which is usually saprophytic, becomes under favorable conditions an aggressive parasite.

Take-all and its control, G. H. Robinson (*Jour. Dept. Agr. Victoria, 5 (1907), No. 4, pp. 253-256*).—A description is given of the disease known in Australia as take-all, which is due to the fungus *Ophiobolus graminis*. For the control of this disease rotation of crops, burning over of badly affected stubble, early fallowing, and the substitution of crops not liable to disease are recommended.

Diseases and injuries to beets in 1906, R. Schander (*Bl. Zuckerrübenbau, 14 (1907), No. 8, pp. 113–119*).—The summer of 1906 is said to have been especially favorable to plant diseases in West Prussia, and brief accounts are given of the more important fungi and insects observed as attacking beets. Among the more important ones described are the beet-root rot (*Phoma betæ*), a dry rot, and a rot due to *Rhizoctonia violacea*, which were especially destructive. Beet scab and the leaf spot caused by *Uromyces betæ* were not very prevalent and the bacterial black rot was not observed. Among the more troublesome animal pests were nematodes, wireworms, field mice, etc. Suggestions are given for the control of all the serious pests.

The zonal beet scab, A. Stift (*Bl. Zuckerrübenbau, 14 (1907), No. 10, pp. 151–153*).—A description is given of a form of beet scab that from its habit of girdling the root is called zonal scab. This disease has been attributed by different authors to various causes, one claiming that it is caused by attacks of minute worms, species of Enchytræidæ, followed by *Oospora* sp. (E. S. R., 16,

p. 886), and that the sugar content of the beet is diminished in direct proportion to the severity of the attack of the disease.

After investigating this disease for several years the author failed to find any connection between the dry weight, sugar content, etc., of beets and the presence of the disease. He also failed to discover that the worms had anything to do with it. In regard to the fungus he reserves his opinion until further study.

The selection of sugar cane cuttings in combating the red rot, E. J. BUTLER (*Agr. Jour. India, 2 (1907), No. 2, pp. 193–201, pls. 3*).—An experiment in selecting seed cane for the prevention of the red rot of sugar cane caused by the fungus *Colletotrichum falcatum* is described.

An especially susceptible variety of cane was selected to test the effect of planting the red-spotted and spot-free cuttings. The effect of planting diseased cuttings was so marked that the author suggests the inspection of all cuttings, and, as the fungus often does not run through the whole cane, tops instead of butt sections should be selected for planting. Experiments show that the fungus does not persist long in the soil, and with the planting of more resistant varieties and the examination of cuttings much of the present loss would be avoided.

The smuts of cereals; their distribution and prevention, O. BREFELD, O. APPEL, ET AL. (*Jahrb. Deut. Landw. Gesell., 22 (1907), No. 1, pp. 75–91*).—After a review, showing the status of information regarding cereal smuts, an account is given of various methods for their control. These include hot water, formalin, copper sulphate, and other treatments of the seed, and the efficiency of the different methods in preventing smut as well as the effect of the different treatments on the germination of the seed are discussed.

Notes on Ustilago esculenta, S. HORI (*Ann. Mycol., 5 (1907), No. 2, pp. 150–154, pls. 2*).—A description is given of this interesting smut which occurs on species of Zizania, the smutted grains of which are said to be considered quite a delicacy in Formosa. In describing the fungus comparisons are drawn between specimens obtained in Formosa and in Tokio, the Formosa material being much larger in every way. On account of the differences, the author has given an amended description of the fungus and describes its germination, distribution, etc. The smutted plants are said to retain their greenish color for a long time in the autumn and as a consequence are readily distinguished from the normal plants. The smutted shoots assume a long spindle shape and remain within the leaf sheaths for a long time. The leaf shoots of the Formosa specimens attain a length of 10 to 20 cm. or 2 to 4 times larger than those hitherto reported.

Some diseases of cereals caused by Sclerospora graminicola, E. J. BUTLER (*Mem. Dept. Agr. India, Bot. Ser., 2 (1907), No. 1, pp. 24, pls. 5*).—A diseased condition of pearl millet is described in which the heads are transformed into curious leafy proliferations due to the presence of the above fungus. Other portions of the plant are subject to attack, the mycelium of the fungus having been found in the stems, leaves, and various parts of the flower spike. Technical descriptions are given of the various phases of the fungus.

The same organism is said to attack *Andropogon sorghum*, causing a condition known as shredding of the leaves. The fungus occurs in the leaves of this plant, where it destroys the parenchyma, resulting in the torn condition.

In addition to the above, *S. graminicola* occurs on Italian millet and teosinte. Upon the latter host plant only the sporangial stage has been observed.

The characters observed for the fungi on all these hosts agree with those given for Sclerospora, 3 species of which are recognized, and the author believes that probably a fourth should be included, *Peronospora maydis*, thus including all the Peronosporaceæ known to occur on grasses.

Note on the infection and histology of two wheats immune to the attacks of yellow rust, DOROTHEA C. E. MARRYAT (*Jour. Agr. Sci., 2 (1907), No. 2, pp. 129–138, pl. 1*).—Infection and histological experiments are reported in which a variety of wheat (American Club) and Einkorn, a half-wild form of *Triticum monococcum vulgare*, were studied to determine the infection by the yellow rust (*Puccinia glumarum*). For purposes of comparison a very susceptible variety (Michigan Bronze) was used. Seedlings of these three varieties of wheat were grown and when the young plants were well developed all were infected by placing spores on the leaves. These were observed from time to time and the infected material subjected to histological examination. In the normal development of the fungus the germ tubes pass through the stomata into the tissues beneath where haustoria are developed with considerable rapidity. Ordinarily numerous nuclei are present in the hyphæ, large numbers of haustoria are developed, and a healthy condition of the host cells is maintained about the developing fungus. After about 10 days the small hyphæ begin to mass themselves beneath the epidermis and later pustules develop.

In a case of the very resistant Einkorn, the germ tubes enter as usual through the stomata, but almost in the beginning the contents of the hyphæ look watery and show very few nuclei. They appear to be too feeble to send out any haustoria, the host cells in the vicinity of the fungus are shrunken, and in later stages the leaf tissue apppears a dead, shriveled mass.

It appears that in this immune wheat, although the fungus makes its entry and produces abundant hyphæ, yet sooner or later it is starved to death by the breaking down and death of the host tissue in its vicinity, and as a consequence the fungus is unable to make further progress. The host plant, on the other hand, having checked the parasite, continues to flourish except for the small dead areas mentioned above. With the third species of wheat, which appears to be intermediate between the susceptible Michigan Bronze and the resistant Einkorn, the entry takes place through the stomata. The hyphæ appear for a time perfectly healthy and some develop normal haustoria, but before long the progress of the parasite is checked and only in occasional cases are spores produced. In the case of immune varieties, it appears that while the fungus succeeds in making good its entry and producing hyphæ, further progress is completely checked by the breaking down and death of the host tissue accompanied by the starvation and death of the parasite, as in the Einkorn, or else a more protracted struggle takes place, as in the American Club. In the latter case the development proceeds to a farther point, but is retarded as compared with a normal case such as described from the Michigan Bronze.

The reason for this immunity is unknown, but for the present the author suggests that it is probably due to the production of certain toxins and antitoxins by host or parasite, or both, which are mutually destructive.

A leaf-curl disease of cassava, A. ZIMMERMANN (*Pflanzer, 2 (1906), No. 10, p. 145; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 18 (1907), No. 10–12, pp. 366, 367*).—A description is given of a disease of cassava in which the leaves become curled and variously distorted. So far a large number of causes have been assigned to this disease, but after investigating the subject the author reports that he is unable to find any fungus or animal parasite in the affected leaves, and he believes that it is very likely due to causes similar to those producing the mosaic disease of tobacco, the infectious chlorosis of mallows, etc. Some varieties of cassava seem to be especially subject to it, and in making plantings those that are known to be liable to it should be rejected.

The American gooseberry mildew (*Jour. Bd. Agr.* [*London*], *14* (*1907*), *No. 2, pp. 104–106, pl. 1, figs. 2*).—An illustrative description is given of the American gooseberry mildew (*Sphærotheca Mors-uvæ*), which appears to be quite destructive to gooseberries and seems to be spreading in different parts of Europe. An account is given of this disease so that growers may be able to recognize it upon their bushes and aid in repressing its distribution.

Notes on some diseases of the pineapple, N. A. Cobb (*Hawaii. Forester and Agr.*, *4* (*1907*), *No. 5, pp. 123–144, figs. 9*).—The author gives an account of some of the more troublesome diseases of the pineapple in Hawaii and calls attention to the occurrence of *Thielaviopsis ethaceticus* on the pineapple.

This fungus, which has been previously described by the author (E. S. R., 18, p. 843), causes the well-known pineapple disease of sugar cane as well as the most common rot of pineapples in Hawaii. It is characterized on the fruit by a blackening which usually begins at the cut end of the stem and spreads upward through the core, ultimately involving the entire fruit. This discoloration, which is dark at first, becomes sooty black when fully developed. The fungus is described at considerable length, and its dissemination on the pineapple seems to be associated with various insects, principally flies. The author suggests that where tops are used for planting, diseased specimens should be eliminated as far as possible. Additional precautions of dipping in fungicides will probably be found advantageous. Experiments with the treatment of sugar cane for the prevention of this disease have proved very efficient, and the use of Bordeaux mixture or tar upon the pineapple cuttings is recommended as a preventive treatment.

Diseases of coffee, G. Delacroix (*Agr. Prat. Pays Chauds*, *7* (*1907*), *Nos. 50, pp. 384–399; 52, pp. 26–41; 53, pp. 152–165, pls. 3*).—A description is given of some of the better known diseases of coffee, the author grouping them according to whether they are due to nonparasitic or parasitic causes. Among the leaf diseases of coffee the principal one described is that caused by *Hemileia vastatrix*.

Root diseases of tea, T. Petch (*Trop. Agr. and Mag. Ceylon Agr. Soc.*, *28* (*1907*), *No. 5, pp. 292–296, pl. 1*).—The author describes some root diseases of the tea plant which have previously been referred to a fungus, *Rosellinia radiciperda*, but which are now believed to be due to different fungi. One form of the disease which is said to occur on tea plants growing at an elevation of 4,000 ft. or more is caused by the fungus *Porias hypolateritia*. This fungus also attacks the roots of Hevea rubber and seems to spread to the tea roots from stumps of various forest trees. In the lower districts a root disease of tea appears in which the roots show black nodules from which arise an underground mycelium which spreads between the wood and the bark in white or yellowish fan-shaped patches. The fungus appears to be an undescribed species of Ustilina, a brief description of which is given. For preventing these diseases the author recommends the digging out and burning of dead bushes and the burying or burning of all tea prunings.

The downy mildew of grapes and its control, J. Capus (*Rev. Vit.*, *27* (*1907*), *Nos. 705, pp. 677–680; 706, pp. 705–708*).—The author has made a study of the downy mildew of grapes and its control, the investigations covering a period of 5 years.

The appearance of the mildew on the vines was found to be closely associated with periods of high temperature, and the period of incubation of the various invasions varied from 7 to 28 days, depending upon the prevailing temperature conditions. As a rule the mildew was found to be most severe in its attacks on the older leaves, the young leaves being nearly free from the invasion of the

fungus. On this account it was found to be especially necessary to protect the foliage with fungicides during the months of August and September.

Experiments were conducted with different strengths of copper sulphate solutions and Bordeaux mixture, and it was found that while weak solutions were efficient in protecting the leaves for a time against the invasion of the fungus, the period of protection was much shorter than where stronger solutions were employed. In a comparison of the efficiency of simple solutions of copper sulphate a 1 per cent solution upon the leaves remained protective for 28 days, while a 2 per cent solution remained efficient for 48 days. A solution containing about ¼ of 1 per cent copper sulphate was effective for only 7 or 8 days. In practice it was found that spraying thoroughly with a 2 per cent solution late in July will ordinarily protect vines against the downy mildew throughout the remainder of the season.

The resistance of table grapes to downy mildew, R. SALOMON (*Rev. Vit., 27 (1907), Nos. 701, pp. 576–578; 703, pp. 630–633*).—A report is given of investigations to determine the relative susceptibility of varieties of table grapes to mildew. In all 180 varieties, represented by over 800 specimens, were observed during the years 1902, 1903, 1904, and 1905. The grapevines were all in the same field, were sprayed 3 times with Bordeaux mixture, and were subjected to similar conditions throughout. In reporting upon these different varieties the author adopted a scale of resistance, and while some differences were noted due to slight attacks of the fungus on some of the species, yet in general the relative resistance remained the same. The relative resistance of the different varieties is shown in tabular form

A new treatment for downy mildew, E. CHUARD (*Chron. Agr. Vaud, 20 (1907), No. 9, pp. 181–188*).—In reporting upon experiments for the control of the downy mildew of grapes, the author gives an account of the use of a new fungicide which he claims has proved very efficient. This fungicide is made by dissolving 200 gm. of copper oxychlorid in a hectoliter of water, with which the vines were given 5 applications. The copper oxychlorid is said to be an intermediate product in the manufacture of copper sulphate and consists of a combination of chlorate and oxid of copper. This fungicide does not appear to injure the foliage even when used in very strong solutions. It is sufficiently noticeable when sprayed upon foliage and appears to be exceedingly adhesive.

A disease of larch trees in Jura, L. MANGIN and P. HARIOT (*Bul. Trimest. Soc. Mycol. France, 23 (1907), No. 1, pp. 53–68, figs. 9*).—A description is given of a disease of larch trees which is characterized by the orange-red color assumed by the leaves of diseased trees. These, standing out against the uniform green color of the other trees, make them very conspicuous objects. This disease has been attributed to the fungus *Hypoderma nervisequum*, but the authors have found a number of species of fungi attacking the foliage, the more important of which are noted in a preliminary account (E. S. R., 18, p. 650). In addition to these fungi a number of others seem to occur quite uniformly upon the leaves, so that the authors are unable to decide what particular organisms are the cause of the disease. It is believed, however, that *Rhizosphæra abietis* is one of the most prominent in causing the trouble.

A disease of maple trees, F. VON HÖHNEL (*Österr. Bot. Ztschr., 57 (1907), No. 5, pp. 177–181*).—A disease of the maple, *Acer campestre*, is described which is attributed to the fungus *Polyporus radiatus*. The author points out resemblances between this fungus and a number of other allied species and gives a technical description of it.

The leaf blotch of maples (*Jour. Bd. Agr. [London], 14 (1907), No. 2, pp. 106, 107, fig. 1*).—Descriptive accounts are given of two forms of leaf blotch occurring on different species of maple, the fungi causing them being *Rhytisma acerinum* and *R. punctatum*. As a means of preventing the spread of this disease it is recommended that the dead leaves lying upon the ground be collected and burned, as the fungus passes the winter upon them.

A pine disease (*Jour. Bd. Agr.* [*London*], *14* (*1907*), *No. 3, pp. 164–166*).—It is stated that diseased shoots of pine have been sent to Kew from time to time, but until March, 1906, no definite statement could be given as to the primary cause of the disease by reason of the failure to secure the development of the fungus.

The disease is confined to the terminal shoots and may be recognized by the yellowing and subsequent shedding of the leaves, followed by the death of the shoots, which die back for a distance of 6 to 10 in. These dead shoots are persistent and furnish centers for infection of other shoots. An investigation of the host plant showed that the injury was due to the fungus *Diplodia pinea*, a wound parasite.

Inoculation experiments demonstrated that within 2 months after infection the leaves become yellow and at the expiration of 4 months the leaves have fallen and the shoot is dead. These experiments were carried on with 3-year-old plants of white pine, Scotch pine, spruce, silver fir, and larch, by placing the spores on the young shoots, but positive results were obtained only in the case of the 2 species of pine.

Although the fungus is quite destructive, its entry to the host was found to depend on the presence of some previous wound and it is probably associated with some insect, but as yet this point has not been settled.

In the case of nursery stock and young trees the author recommends the removal of all dead shoots to prevent the further spread of the fungus.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Outlines of zoology for foresters, A. JACOBI (*Grundriss der Zoologie für Forstleute. Tübingen: H. Laupp'schen, 1906, pp. XI+263, figs. 441*).—The present volume is intended as a supplement to T. Lorey's Handbook of Forestry, as it is believed that in the latter volume the subject of forest zoology was not considered at sufficient length for the purposes of the practical forester. In this supplementary volume, therefore, a general account is given of gross and microscopic anatomy of animals. The greater part of the volume is occupied with a systematic account of the various groups of animals which are of economic importance to the forester.

Destruction of deer by the northern timber wolf, V. BAILEY (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 58, pp. 2*).—In northern Michigan, Wisconsin, and Minnesota it is reported that deer are killed in considerable numbers in the deep snow of winter by timber wolves. In this section of the country the breeding season for the wolves appears to be later than in the Rocky Mountains. Wolves may be destroyed by locating the dens and killing the puppies, or by the use of traps.

Game protection in Florida, R. W. WILLIAMS, Jr. (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 59, pp. 11, fig. 1*).—The essential facts in the history of legislation regarding game protection in Florida are presented, together with a list of the game laws of that State. The author also takes occasion to discuss the present status of game protection in Florida and the functions of game commissioners.

Notes on the Sabi game reserve, J. S. HAMILTON (*Transvaal Agr. Jour., 5* (*1907*), *No. 19, pp. 603–617, pl. 1*).—The Sabi game reserve was established in the Transvaal in 1898 and has been found to serve excellently well the purposes for which it was set aside. The animals which are protected in this reserve are not found in the United States, but the author calls attention to the fact that the conditions in South Africa and the United States are essentially the same in that a number of the most interesting and most valuable native animals are apparently doomed to extinction unless given the protection of a reserve.

Methods of destroying rats, D. E. Lantz (*U. S. Dept. Agr., Farmers' Bul. 297, pp. 8, fig. 1*).—The common brown rat is considered the most injurious mammal in the country. It may be combated by poisoning with barium carbonate, strychnin, arsenic, or phosphorus; trapping, especially with some form of guillotine trap; the use of ferrets and dogs; fumigation with carbon bisulphid in burrows; and by the general adoption of rat-proof construction of buildings, which may be accomplished by the use of cement.

Means of destroying rats, mice, and snails, H. Raebiger (*Jahrb. Deut. Landw. Gesell., 22 (1907), No. 1, pp. 104–130*).—The common methods for the destruction of rats and mice include the use of traps, poisons, and bacterial cultures. In the author's experience, traps and poisons have given less satisfactory results than bacterial virus, particularly a form of virus which has been extensively used by the German Agricultural Society. In some instances, this does not cause an infection, but the author believes that rats and mice vary greatly in their resisting power.

In combating snails and slugs, the author recommends sprinkling dry powdered lime on plants so that snails will come in contact with it. The lime dust sets up a fatal irritation on the integument of snails.

The occurrence of field mice and means of combating them, N. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 5 (1907), No. 5, pp. 50, 51*).—Brief notes are given on the injuries which may be produced by field mice and on the distribution of virus for causing infection among these pests.

The protection of our native birds, T. H. Montgomery, Jr. (*Bul. Univ. Texas, Sci. Ser. No. 8, pp. 30*).—The author presents a series of arguments in favor of bird protection and gives data regarding the destruction of birds for food and millinery purposes and on the means of bird protection.

Bird protection, H. von Berlepsch (*Jahrb. Deut. Landw. Gesell., 22 (1907), No. 1, pp. 130–157, figs. 20*).—Descriptions are given of a large number of devices for feeding birds and for use in nesting.

Injurious birds, Knotek (*Naturw. Ztschr. Land u. Forstw., 5 (1907), No. 6, pp. 273–280, figs. 3*).—Particular attention was directed to the attacks of magpies, jays, and various species of crows on corn. Illustrations are also given of the injury to the foliage of coniferous trees from various wild species of grouse.

Index-catalogue of medical and veterinary zoology, C. W. Stiles and A. Hassall (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 39, pt. 18, pp. 1305–1398*).—This part of the bulletin contains the names of authors arranged alphabetically from Martius to Mitrofanow.

The use of glass vessels in the study of the relations between insects and flowers, F. Plateau (*Acad. Roy. Belg., Bul. Cl. Sci., 1906, No. 12, pp. 741–775, figs. 2*).—In the author's experience it appears that the color of flowers is not as important a source of attraction to insects as has usually been assumed. Other factors are observed to exercise more influence in determining the flight of insects in visiting flowers.

Fourth annual report of the State entomologist of Montana, R. A. Cooley (*Montana Sta. Bul. 64, pp. 33–45*).—Brief notes are given on the cutworms in winter wheat fields, the sugar-beet webworm, codling moth, cabbage plutella, currant spanworm, rose slug, spotted blister beetle, grasshoppers, cabbage aphis, etc.

The monthly bulletin of the division of zoology, H. A. SURFACE (*Penn. Dept. Agr., Mo. Bul. Div. Zool., 4 (1907), Nos. 11, pp. 385–414; 12, pp. 415–450, pls. 6*).—Notes are given on methods of destroying the cabbage root-worm and San José scale. Remedies are also suggested for use in controlling codling moth, cutworm, tent caterpillars, etc.

On some injurious insects in 1906, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 19 (1907), pp. 173–188*).—*Lampronia rubiella* on raspberries may be best combated by cutting off and burning infested shoots. Raspberry weevils are partly controlled by the cautious use of boiling water about the canes. Protection may be afforded strawberries against the attack of ground beetles by the use of baited traps at night.

In insecticide work against the currant gall mite the best results were obtained from dusting infested plants with a mixture of lime and sulphur. The author found that grain weevils would remain alive for from 8 to 14 months in small tubes partly filled with wheat.

The natural history of Tapinostola musculosa, S. MOKRZECKI (*Ztschr. Wiss. Insektenbiol., 3 (1907), Nos. 2, pp. 50–53; 3, pp. 87–92, figs. 6*).—The caterpillar of this moth attacks the stems of wheat, barley, rye, and other cereals, causing at times serious losses. The insect passes the winter in the egg stage, and since the eggs are deposited on stubble and volunteer grass and other plants in grain fields, obvious remedies are to burn the stubble after harvest or to plow the ground deeply.

A fight with climbing cutworms (Leucania unipuncta), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 18 (1907), No. 3, pp. 265–268*).—A description is given of a serious outbreak of army worms in which good success was had from the use of poisoned bait composed of bran and Paris green.

The periodical cicada in 1907, C. L. MARLATT (*U. S. Dept. Agr., Bur. Ent. Circ. 89, pp. 4, figs. 3*).—This circular is published for the purpose of eliciting information concerning the brood of periodical cicada which appeared in May and June of this year throughout the southern States, east of Texas, except Florida, and northward as far as Iowa and Illinois.

The use of cloth barriers and hopperdozers in combating locusts, E. DE BANÓ (*Com. Par. Agr. [Mexico], Circ. 56, pp. 9, pls. 8*).—A description of methods adopted in combating the locust plague in Hungary. In this campaign barriers were constructed of cloth and the locusts were gradually driven into partly enclosed spaces in which they were easily captured. An account is also given of various forms of hopperdozers used for the same purpose.

Some insects injurious to truck crops. The asparagus miner. Notes on the asparagus beetles, F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul. 66, pt. 1, pp. 10, figs. 2*).—*Agromyza simplex* has been known as causing injury to asparagus since 1896. It is distributed from New England to Tennessee. Notes are given on its habits and life history. The larvæ live under the epidermis of the stems. In controlling this insect it is recommended that a few volunteer asparagus plants be allowed to grow as a trap crop in the spring and that these be later destroyed. It would also be well to pull up and destroy infested plants in old asparagus beds in order to accomplish the destruction of the second brood of flies.

Some insects injurious to truck crops. The water-cress sowbug. The water-cress leaf-beetle, F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul. 66, pt. 2, pp. 9–20, figs. 3*).—An aquatic sowbug, belonging to the species *Mancasellus brachyurus*, is reported as causing great injury to water-cress in Virginia, West Virginia, and Pennsylvania. According to some of the correspondents of the Bureau it is practically impossible to control this pest by means of insecticides alone. The best results are obtained by constructing the beds in which the water-cress is grown with a trough running through the central lowest point at such a grade that the water can be drained off at will. The sowbugs follow the receding water, and when they are all in the trough they may be destroyed by the liberal use of sulphate of copper. It is possible that carp and other fish may also be of service in destroying this pest.

The water-cress leaf beetle (*Phædon æruginosa*) was reported as injuring water-cress in Pennsylvania in 1903. The beetle is described in its various stages and notes are given on its life history. Some benefit is derived by the application of Paris green to infested water-cress, but this should not be done later than 1 week before the cress is picked. Better results are reported from growing water-cress in running water which carries the beetles away.

Biological notes on the Colorado potato beetle, with technical description of its stages, A. A. GIRAULT and A. H. ROSENFELD (*Psyche, 14 (1907), No. 3, pp. 45–57*).—Opportunity was had to study the various stages in the life history of the Colorado potato beetle at Myrtle, Georgia. The insect is described in all its stages and notes are given on the duration of these stages and the external appearance of the insect as observed in the Southern States.

The Colorado potato beetle, F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Circ. 87, pp. 15, figs. 6*).—In the gradual spread of this insect its attacks upon potatoes become so severe in localities where it is little known that information regarding its life history and methods of combating it seems to be required. The beetle is believed to have originated in Colorado and after having traveled to the Atlantic Coast has been spreading northward and southward, although climatic conditions are not always favorable. Its spread eastward was more rapid than its present extension southward. It has not been able to cross the Rocky Mountains.

Notes are given on its habits, life history, food plants, and natural enemies. The methods of control suggested by the author include jarring, brushing, fall plowing, the eradication of wild weeds upon which the beetles feed, and the use of arsenicals, including Paris green applied dry or in water or Bordeaux mixture, arsenate of lead, and other arsenicals. Preference is given to arsenate of lead.

Combating grapevine flea beetle, FONZES-DIACON (*Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), No. 20, pp. 582–585*).—A formula has been proposed for the preparation of an insecticide to destroy grapevine flea beetles, which calls for 500 gm. anhydrous arsenate of soda and 225 gm. of lime per 100 liters of water. The author calls attention to the fact that the insecticide resulting from the chemical action of these constituents varies considerably in composition and that some arsenate of soda may remain unchanged, although it has been claimed that the effective element of the insecticide was the arsenate of lime.

Insects affecting fruit trees, C. J. S. BETHUNE (*Ontario Dept. Agr. Bul. 158, pp. 36, figs. 4*).—A popular presentation is made of the important facts relating to insect pests of the apple, pear, plum, cherry, peach, and grape. Formulas are also given for the preparation of lime-sulphur wash, kerosene emulsion, Paris green and Bordeaux mixture, and other insecticides.

Xyleborus xylographus as an orchard pest, O. E. BREMNER (*Canad. Ent., 39 (1907), No. 6, pp. 195, 196*).—This species of ambrosia beetle is commonly reported as attacking only those trees which are already dead or dying as a result of some disease or insect injury. The author observed primary attacks of the pest, however, upon healthy peach and plum trees. Galleries containing the insect in all stages of development were found from early spring until fall. Apparently the beetles enter the tree from the north and east sides and ordinarily not more than 6 ft. from the ground.

Kerosene remedy and the fruit fly, G. COMPERE (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 4, pp. 244, 245, pl. 1*).—A self-feeding kerosene trap has been devised which seems to have been quite effective in catching the fruit fly. According to the author's experience the odor of kerosene attracts this insect.

Combating codling moth with arsenicals, J. BARSACQ (*Jardin, 21 (1907), No. 484, pp. 124-126, figs. 2*).—Mixtures of Paris green, lime, and flour in water were used in spraying to combat the codling moth. It is considered that the first application should be made while the calyx is still open and that this should be immediately repeated if followed by a rain storm. In these experiments control trees showed 14.45 per cent of infested fruit, while trees sprayed with the Paris green bore only 7.46 per cent of wormy apples. Arsenate of lead in Bordeaux mixture gave still better results, the percentage of infestation being 2.15.

The terrapin scale, J. G. SANDERS (*U. S. Dept. Agr., Bur. Ent. Circ. 88, pp. 4, figs. 3*).—A detailed description is given of *Eulecanium nigrofasciatum* with notes on its food plants and natural enemies. This pest affects chiefly peach trees. It can not be satisfactorily controlled with the lime-sulphur wash, but kerosene emulsion gives good results.

Notes on Chermes, BÖRNER (*Mitt. K. Biol. Anst. Land u. Forstw., 2 (1907), No. 4, pp. 54-60, figs. 8*).—The various stages in the life cycle of *Chermes strobilobius* and *C. abietis* are presented.

The history of certain insect pests of the olive, A. BERLESE (*Redia, 4 (1907), No. 1, pp. 1-180, pls. 3, figs. 60*).—A detailed report is made on the work of the Royal Agricultural Entomological Station at Florence on olive insects, particularly olive fly, *Lasioptera berlesiana, Lecanium oleæ, Philippia oleæ*, etc. The author calls attention to the great variation in the numbers of these insect pests which appear from year to year. This variation appears to be due largely to the relative prevalence of their natural enemies, particularly parasites and predaceous insects. In combating the olive fly it is stated that excellent results have been obtained for a number of years from the use of a mixture containing 65 parts of molasses, 31 parts of honey, 2 parts of glycerin, and 2 parts of arsenite of soda.

Combating the olive fly, J. AGUET (*Coltivatore, 53 (1907), No. 19, pp. 586-590*).—In the author's opinion too little attention has been given to the natural enemies of the olive fly in the systems of artificial treatments which have been devised for its control.

Insects affecting park and woodland trees, E. P. FELT (*N. Y. State Mus. Mem. 8, vols. 1, pp. 1-332+a333-a459; 2, pp. 333-877, pls. 70, figs. 223*).—For a number of years the author and his assistants have been working on a comprehensive account of the insects of forest and shade trees. The present work is the most elaborate on the subject which has appeared in the United States since the fifth report of the United States Entomological Commission, by Doctor Packard. Both volumes are elaborately illustrated.

The subject material includes a general account of the biology of insects and the means of preventing their attacks and detailed economic discussions of all of the more important insects of forest and shade trees. These are classified primarily into borers, leaf feeders, and sucking insects, and again into the enemies of deciduous trees and coniferous trees. Bibliographical notes are given throughout the text, and a supplemental bibliography on forest insects is appended to volume 2 (pp. 701-755).

Wood wasps, R. S. MACDOUGALL (*Jour. Bd. Agr. [London], 14 (1907), No. 2, pp. 98-104, figs. 4*).—The habits and life history of the genera Sirex and Xiphydria are briefly outlined. If these insects cause serious injuries to trees, their attacks may be partly prevented by removing and destroying or utilizing all diseased trees and fallen trunks and branches.

Occurrence of a sport in Melasoma scripta and its behavior in heredity, ISABEL MCCRACKEN (*Jour. Expt. Zool., 4 (1907), No. 2, pp. 221-238, pl. 1*).—The cottonwood leaf beetle has long been known to occur under a variety of color patterns. The frequent occurrence of pure black individuals indicates that this is a natural type of the species. This type does not adhere to Mendelian principles in inheritance, but behaves as a Mendelian recessive in first crosses.

The white-pine weevil, A. D. HOPKINS (*U. S. Dept. Agr., Bur. Ent. Circ. 90, pp. 8, figs. 6*).—The adults of *Pissodes strobi* appear in early May and feed upon the bark of the terminal shoots of white pine, later laying their eggs in the same situation. The adults are active for about 2 weeks. The white pine is the chief host plant, but cultivated spruces, jack pine, and other species of pine are sometimes attacked. The beetle is distributed from North Carolina to New Brunswick and westward to Wisconsin. Infested trees may be recognized by the abnormal development of the terminal shoots. The beetle does not breed in the bark of stumps. The method of treatment recommended by the author consists in collecting infested terminal shoots during the first half of July and placing them in barrels covered with screens so that the parasites may escape, after which the beetles are to be destroyed.

Some household pests, J. B. SMITH (*New Jersey Stas. Bul. 203, pp. 47, figs. 31*).—Practical notes and suggestions are given regarding the occurrence and means of combating the more important household insect pests, including roaches, ants, carpet beetles, moths, bedbugs, fleas, lice, flies, meal worms, larder beetles, white ants, powder-post beetles, centipedes, drug and cigar beetles, fish moth, and book lice. In the case of each one of these pests, notes are given on the life history of the insect and on the methods which have given best results in the hands of the author and other investigators. Suggestions are also made regarding general methods for the destruction of household insects, particularly by fumigation with sulphur and hydrocyanic-acid gas.

Second report upon the horseflies of Louisiana, J. S. HINE (*Louisiana Stas. Bul. 93, pp. 59, figs. 37*).—The purpose of the investigations reported in this bulletin was to obtain knowledge of the life history of horseflies which would serve as a basis for the formulation of practical rules for controlling these pests.

Horseflies appear to prefer swampy or wooded areas. One parasite was found attacking the eggs of Tabanus. *Monedula carolina* is reported as preying upon horseflies. Analytical keys are presented for the identification of the Tabanidæ of the United States and the species of Chrysops and Tabanus found in Louisiana. Each species is described with notes on its habits and life history.

Two little-known ticks of the Transvaal, C. W. HOWARD (*Transvaal Agr. Jour., 5 (1907), No. 19, pp. 581-584, pls. 2*).—An account is presented of the biology and economic relations of *Argas persicus* and *Ornithodoros savignyi cæcus*, the first species attacking fowls and the second being parasitic on man and other animals.

The fowl tick is very common throughout South Africa and is also widely distributed in other parts of the world. It is found on all kinds of domestic fowl, including also ostriches and canaries. *O. savignyi cæcus*, known by the common name of tampan, resembles the fowl tick but is considerably larger. It occurs in the dry and warm parts of South Africa and in some localities is a serious pest of man and domestic animals, particularly cattle and horses.

Sarcophaga caridei, a new species of fly parasitic on locusts, J. Brèthes (*An. Mus. Nac. Buenos Aires, 3. ser., 6 (1906), pp. 297–301, figs. 3*).—A technical description is given of the new species of fly under the name *Sarcophaga caridei*, parasitic on locusts. This constitutes the fourth species observed by the author as parasites of injurious locusts. Brief notes are included on the biology of this species.

Spraying, A. Dickens and R. E. Eastman (*Kansas Sta. Bul. 145, pp. 193–216, figs. 7*).—The orchards and vineyards of the Kansas Station have been regularly sprayed since 1887 and during this time Paris green, London purple, and arsenate of lead have been extensively used. Paris green is sometimes adulterated and the results obtained from London purple are not always uniform. Arsenate of lead has given the best results. The most satisfactory fungicide is Bordeaux mixture, and the best combination insecticide and fungicide is Bordeaux mixture and arsenate of lead. Details are given regarding spraying apparatus and a brief spray calendar is appended to the bulletin.

Spray calendar (*New York Cornell Sta. Bul. 245, pp. 127–136*).—The common garden, orchard, and ornamental plants are arranged in an alphabetical order with statements regarding the most important insects and fungus diseases to which these plants are subject and the most effective remedies for use in their control. Formulas are also given for the preparation of standard insecticides and fungicides.

The zoological bulletin of the division of zoology, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 1, pp. 32, pls. 3*).—Formulas are given for the preparation of standard insecticides and fungicides in the control of some of the more important insect pests and fungus diseases.

Fumigation of citrus trees with hydrocyanic-acid gas, F. Thomsen (*Transvaal Agr. Jour., 5 (1907), No. 19, pp. 710–715, pls. 3*).—Detailed directions regarding the formulas to be used in mixing the chemicals for the production of hydrocyanic-acid gas and also regarding the quantities to be used in tents over trees of different sizes.

The vetch as a honey plant, L. Lebreton (*Apiculteur, 51 (1907), No. 5, pp. 196–198, fig. 1*).—Notes are given on the extent of cultivation and the biology of different varieties of vetch. These plants furnish honey-bearing nectar in flowers and stipules. They are not honey plants of the first order, but are well worth considering.

Foul brood of bees, Maassen (*Mitt. K. Biol. Anst. Land u. Forstw., 2 (1907), No. 4, pp. 51–53, figs. 6*).—According to the author's investigations at least three organisms may be found in cases of foul brood. These are *Bacillus alvei*, *B. brandenburgiensis*, and *Streptococcus apis*. Further investigations will be made to determine the relative importance of these organisms in the production of foul brood.

Quarantine regulations against insects and plant diseases, J. T. Crawley (*Bol. Ofic. Sec. Agr. Cuba, 2 (1907), No. 5, pp. 315–327*).—A copy is given of the Cuban quarantine regulations promulgated on April 27, 1907, for the prevention of the introduction of injurious insects and plant diseases. The official method of generating hydrocyanic-acid gas and applying this remedy in the fumigation of plants is included.

Economic entomology and current literature, 1906, W. W. Froggatt (*Agr. Gaz. N. S. Wales, 18 (1907), No. 4, pp. 354–359*).—A brief review of some of the more important entomological literature of 1906, with particular reference to cattle ticks, mango weevil, cotton insects, and spray formulas.

FOODS—HUMAN NUTRITION.

Foods; their chemistry, analysis, and nutritive value, A. BALLAND (*Les Aliments. Chimie, Analyse, Expertise Valeur alimentaire. Paris: J. B. Baillière & Sons, 1907, vols. 1, pp. VII+432; 2, pp. 508*).—In this extended treatise on foods the author has summarized and discussed a large amount of available data regarding composition and nutritive value of foods and feeding stuffs.

Volume 1 contains cereals and products obtained from them, bread, and bakers' goods, and volume 2, vegetables, fruits, meat, dairy products, preserved foods, beverages, and feeding stuffs.

How may we best nourish ourselves? A. GAUTIER (*Rev. Sci. [Paris], 5. ser., 7 (1907), No. 11, pp. 321–326*).—The composition and properties of the more common food materials, the proportion of nutrients required, and related questions are discussed.

Formaldehyde in food materials, A. MONVOISIN (*Hyg. Viande et Lait, 1 (1907), No. 3, pp. 111–113*).—Data are summarized regarding the normal occurrence of formaldehyde in certain foods, particularly those which have been smoked. In the author's opinion the amount is so extremely small that it is of no importance from the standpoint of health. Data are also summarized regarding the determination of formaldehyde.

[**Food used in mountain climbing in Alaska**], F. A. COOKE (*Harper's Mo. Mag., 114 (1907), No. 684, pp. 821–837, pl. 1, figs. 13*).—In an article describing the first ascent of Mt. McKinley the author states that the ration allowance per man per day was 10 oz. of bread, 1 lb. of pemmican, 4 oz. sugar, 0.5 oz. tea, and 4 oz. "erbswurst," with 3 oz. wood alcohol for fuel. This allowance was so liberal that the food intended for 10 days was found sufficient for nearly 13 days. The pemmican used was made of equal parts of beef tallow and dried beef. The bread was specially prepared in camp and was baked in pellets not larger than a good-sized marble in a reflector in front of the fire until quite brown. The reflector was then moved farther from the fire and the bread dried until very hard. The dough used was made of flour and baking powder in the usual way, except that all shortening was omitted. "No grease was put in the pan nor the dough, for this seemed to prevent the drying process." The work performed on this ration was exhausting in the extreme.

[Calculated with the aid of average figures for the composition of the foods, the ration allowance furnished 208 grams protein and 4,790 calories of energy per man per day, or 167 grams protein and 3,835 calories of energy per day on the assumption that 10 days' food sufficed for 12½ days.]

Composition of East Indian food stuffs analyzed at the Colonial Museum, Haarlem, M. GRESHOFF, W. M. CLUWEN, and C. L. DE FOUW (*Bul. Kolon. Mus. Haarlem, 1906, No. 34, Sup.; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 7, pp. 433, 434*).—Rice, barley, buckwheat, and other cereals, dried chestnuts, St. John's bread, asparagus, portulaca, endive and other vegetables, raspberries, strawberries, cherries, and other fresh and preserved fruits, chocolate, wine, beer, shellfish, goat's milk, cream, sheep's milk, Swiss cheese, and other miscellaneous food stuffs were analyzed.

Studies on the digestibility and nutritive value of legumes at the University of Tennessee, 1901–1905, C. E. WAIT (*U. S. Dept. Agr., Office Expt. Stas. Bul. 187, pp. 55*).—Red kidney beans, white navy beans, and 3 varieties of cowpeas were used in the 72 digestion experiments with healthy men which are reported in this bulletin. The legumes constituted a large part of the simple mixed diet. The following table summarizes the results obtained:

Summary of results of digestion experiments with different legumes.

Character of diet.	Digestibility of total diet.			Digestibility of legumes alone.	
	Protein.	Fat	Carbohydrates.	Protein.	Carbohydrates.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Basal ration alone	91	95	98	....	....
Basal ration and kidney beans	78	89	95	77	94
Basal ration and white beans	81	88	95	78	96
Basal ration and cowpeas, whippoorwill	77	91	92	70	87
Basal ration and cowpeas, clay	81	93	94	74	88
Basal ration and cowpeas, lady	87	91	97	83	95

"In view of their richness in nutrient constituents, and the extent to which these are digested and absorbed by the body, the legumes deserve a high rank as important food materials. The present bulletin but demonstrates scientifically what has perhaps been long believed instinctively with regard to the value of white and kidney beans, but it also shows that whatever may be claimed for them may be claimed with at least equal fairness for the cowpea also.

"The cowpea has a distinctive and pleasing flavor and can be prepared for the table in a great many appetizing ways and compares favorably with other legumes in respect to both nutritive value and digestibility. Its wholesomeness and possible place in the diet is attested by its long and general use in the Southern States. Under usual crop conditions it is reasonable in price and it could undoubtedly be grown in quantities sufficient to meet any demand. The importance of beans, peas, peanuts, lentils, cowpeas, and indeed of legumes as a class is each year becoming more generally recognized as a source of protein in the diet, reasonable in cost as compared with common proteid foods of animal origin, and the use of legumes is increasing."

Potatoes and other root crops used as food, C. F. LANGWORTHY (*U. S. Dept. Agr., Farmers' Bul. 295, pp. 45, figs. 4*).—Potatoes, sweet potatoes, Jerusalem artichokes, tropical starch-bearing roots, such as cassava and yams, succulent roots, tubers, and bulbs, roots used as condiments, and similar food materials are included in this summary of data on the composition, digestibility, and nutritive value of root corps used as food.

Though not very nutritious in proportion to their bulk, root crops as a class, it is pointed out, offer some advantages over most other vegetable foods. They are so easily grown and are so productive that under ordinary conditions they sell at prices within the reach of all. Many of them may be kept over winter in such good condition that they are never out of season. The carbohydrates, the principal nutritive materials present, are in forms which are readily and well assimilated. The characteristic flavor which some of these vegetables possess is a decided advantage, as it makes the vegetables palatable and adds to the variety of the diet. Succulent vegetables of all sorts contribute bulk to the diet and so are valuable from the standpoint of hygiene, as within limits bulkiness is a favorable condition for normal digestion and also of importance in overcoming a tendency to constipation. In addition, the mineral salts which these vegetables contain serve an important purpose in helping to maintain the alkalinity of the blood and have other physiological uses.

Concerning the solanin content of potatoes and the effect of methods of cultivation on the formation of solanin in the potato plant, F. VON MORGEN-

STERN (*Landw. Vers. Stat., 65 (1907), No. 5-6, pp. 301-338*).—On an average, table varieties of potatoes contained 0.0125 per cent solanin and varieties suitable for farm animals 0.0058 per cent. The yellow varieties were found to contain less than red or blue. In general, the author believes that the more pronounced flavor of some varieties of potatoes is due, in part at least, to their higher solanin content. Small or unripe potatoes showed a greater percentage of solanin than full-grown tubers.

As regards methods of culture, it was found that humus, moisture, and potash tended to diminish the solanin content, while phosphoric acid and nitrogen increased it a little, though the effect of the phosphoric acid was very slight. Potatoes which had turned green owing to exposure to the light contained a considerably higher percentage of solanin than normal potatoes. Rotting neither destroyed nor appreciably diminished the solanin content.

Studies of the distribution and function of solanin in the potato plant showed that it occurs most abundantly in the growing and sensitive parts, and the author believes that it primarily serves as a plant protector, though it may also play a part in the assimilation of sugar.

Properties which determine the quality of wheat, A. CSERHATI (*Ztschr. Landw. Versuchsw. Österr., 9 (1906), p. 899; abs. in Chem. Ztg., 30 (1906), No. 102, Repert. No. 55, p. 462*).—Generally speaking, the gluten content of wheat is directly proportional to its protein content, but the proportion of gluten, according to the author, is not a satisfactory measure of the quality of the wheat.

The proteids of barley, their importance for the valuation of grain, and their relation to the steeliness of the barley, E. PRIOR (*Pure Products, 3 (1907), Nos. 2, pp. 92-98; 3, pp. 143-146; 4, pp. 192-195; 5, pp. 232-242*).—The following are some of the conclusions drawn from the extended series of investigations reported by the author:

"The content of water-soluble proteids and nitrogenous substances (leucosin, albumose, etc.) in the barley, and also the edestin-content of the barley, bears no fixed relation to the total protein content of the barley, and it varies within comparatively narrow limits.

"The hordein content of the barley and its content of insoluble proteid rises in general with the total protein content, as may be seen from the calculated average values for both proteids; numerous exceptions are, however, displayed.

"The amount of hordein + insoluble proteid in the barley rises and falls naturally with the total protein content of the barley.

"The percentage composition of the nitrogenous substances of the barley, heretofore designated as total protein, varies greatly and bears no relation to the total nitrogen content. . . .

"The causes of the apparent steeliness (degree of solubility) are the water-soluble, principally colloidal nonnitrogenous and nitrogenous bodies present in the endosperm of the barley, which caulk the starch-converting cells."

A fermented food made from rye flour, K. TEICHERT (*Centbl. Bakt.* [etc.], *2. Abt., 17 (1906), p. 376; abs. in Chem. Ztg., 31 (1907), No. 13, Repert. No. 11, p. 62*).—A Polish dish called "zur" is described, which is made by fermenting a rye-flour batter. After fermentation the dough-like material is cooked in hot water. The article includes a study of the bacteria involved.

The Bambarra groundnut, J. BURTT-DAVY (*Transvaal Agr. Jour., 5 (1907), No. 18, pp. 453-456*).—Analyses of the Bambarra groundnut (*Voandzeia subterranea*) and other data are quoted. According to the author, these nuts, which are similar to the peanut, though sometimes eaten raw, are usually boiled in two or three waters before they are eaten.

Concerning tea, A. D. MAURENBRECHER and B. TOLLENS (*Ber. Deut. Chem. Gesell., 39 (1906), p. 3581; abs. in Chem. Ztg., 30 (1906), No. 102, Repert. No. 55, p. 462*).—Java tea was found to contain 5.6 per cent pentosans on the dry matter basis. By extraction with hot water a trace of fructose, or cane sugar, and glucose was obtained. Hydrolysis with 6 per cent sulphuric acid gave arabinose, galactose, and glucose—so apparently araban, galactan, and glucose-yielding carbohydrate are present in tea leaves.

The carbohydrates of cocoa, A. D. MAURENBRECHER and B. TOLLENS (*Ber. Deut. Chem. Gesell., 39 (1906), p. 3576; abs. in Chem. Ztg., 30 (1906), No. 102, Repert. No. 55, p. 461*).—Cocoa beans freed from fat and shell, when hydrolized with 4 per cent sulphuric acid, yielded λ-arabinose, δ-galactose, and δ-glucose. The shells yielded λ-arabinose, δ-galactose, glucose, and xylose. A chlosterin isolated from cocoa butter had a melting point near that of phytosterin.

Rice, cleaning and polishing, H. McK. FULGHAM (*Bur. of the Census [U. S.] Bul. 61, pp. 49–58, dgm. 1*).—According to the statistical data presented, the total value of the rice products produced in 1905 was $16,296,916, an increase of 86.8 per cent over the values for 1900 to 1905. Processes of manufacture, historical and descriptive data, and other information are presented.

Beet sugar, Z. C. ELKIN (*Bur. of the Census [U. S.] Bul. 61, pp. 59–69*).—Statistical and other data regarding the present condition and distribution of the beet-sugar industry in the United States are reported. According to the figures presented the total value of the beet-sugar products in 1905 was $24,393,794, an increase of 233.1 per cent over the values for 1900 to 1905.

Canning and preserving fruits and vegetables, fish, and oysters, E. K. ELLSWORTH (*Bur. of the Census [U. S.] Bul. 61, pp. 9–48*).—The methods followed in canning fruits and vegetables, fish, and oysters are described. The commercial aspect of the enterprise is discussed with relation to its total amount and present development, the distribution of the industries, and related questions.

According to the data presented, the value of these canned products produced in 1905 was $108,505,471, an increase of 36.2 per cent over the values for 1900 to 1905 and of 98.7 per cent over the values for 1890 to 1900.

The preservation and ripening of meats, H. MARTEL (*Hyg. Viande et Lait, 1 (1907), Nos. 1, pp. 1–14, figs. 3; 2, pp. 53–67*).—The author describes and discusses the different systems of preserving meat by refrigeration and discusses the composition of fresh and refrigerated meat and similar questions.

The principal systems of preparing and preserving meat in use in the Argentine Republic, S. BALDASSARRE (*Arren. Econ. Indus. Freddo, 3 (1906), Nos. 29, pp. 997–1011; 30, pp. 1022–1024, figs. 28*).—The Argentine packing-house system is described and statistics given regarding the extent of the meat trade.

Starch sugar (glucose and grape sugar) as a food adulterant, H. LEFFMANN (*Jour. Amer. Med. Assoc., 48 (1907), No. 4, pp. 318, 319*).—A summary of data on the use of starch sugar is presented. The author believes that owing to possible contamination with sulphuric acid or sulphites this material may be dangerous and that its use should be forbidden in all cases where it merely cheapens the food or beverage.

The microscopical examination of flours and the determination of rice in wheat flour, E. COLLIN (*Jour. Pharm. et Chim., 6. ser., 24 (1906), No. 9, pp. 385–395*).—The detection by means of the microscope of rice flour, which the author states is often used in the adulteration of wheat flour, is described. Attention is drawn to the fact that sometimes rice flour mixed with bean flour is used as an adulterant.

Sulphuring rolled barley and polishing with talcum, F. HUEPPE and R. KRŽIŽAN (*Arch. Hyg.*, *59* (*1906*), *No. 4*, *pp. 313–336*).—A number of samples of barley grits were examined. In the authors' opinion the amount of sulphurous acid retained in sulphured grits is too small to produce a harmful effect. Grits thus treated sometimes have a bad appearance and therefore are polished with talc. Such treatment should be discouraged. Suggestions are made for legislation bearing on the subject.

Concerning the examination and valuation of marmalade, W. LUDWIG (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *13* (*1907*), *No. 1*, *pp. 5–15*).—From the analytical data reported the author concludes that the proportion of material insoluble in water, the alkalinity of the ash, the acid content, the diminution of the water-soluble ash, and the alkalinity of the total and water-soluble ash furnish valuable data for judging the presence in marmalades of foreign bodies, particularly raspberry seeds, raspberry refuse, and apple pulp.

The production of artificial honey (*Bul. Assoc. Chim. Sucr. et Distill.*, *24* (*1907*), *No. 9*, *pp. 1255*, *1256*).—A method of inverting cane sugar with tartaric acid is described and the use of such material for mixing with natural honey is discussed.

The digestion of the proteids of cow's milk in infancy, F. X. WALLS (*Jour. Amer. Med. Assoc.*, *48* (*1907*), *No. 17*, *pp. 1389–1392*, *dgms. 3*).—From records of gains in weight, character of the feces, etc., noted in the case of infants fed different amounts of fat-free cow's milk, the author concludes that there is no evidence to show that the proteid of cow's milk causes any digestive disturbances with infants.

"All experiments prove that cow's proteid is easy to digest and resists putrefaction.

"In sterile fat-free milk we possess an unequaled therapeutic agent in the treatment of the nutritive disorders of infancy."

On zymoids, A. R. BEARN and W. CRAMER (*Bio-Chem. Jour.*, *2* (*1907*), *No. 4*, *pp. 174–183*).—Solutions of enzyms which have been heated to 56–60° C. for 20 to 30 minutes have a strongly inhibitory effect on the activity of the unheated enzym, according to investigations reported, if a sufficiently greater amount of heated enzyms is present. The property of inhibition is usually destroyed by exposure to a temperature of 100° C.

"The inhibition is not due to an antiferment. It is brought about by a reaction between the substrate and substances present in the inactivated enzym. These substances dialyze only very slowly through parchment. In the case of pepsin they are not specific for each species.

"These facts point to the existence of zymoids, which are probably preformed in the enzym preparations. Zymoids, like enzyms, differ in their resistance towards heat. Different enzym preparations vary in the amount of zymoids which they contain."

Influence of day or night feeding on the normal variation in body temperature, E. MAUREL (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 4*, *pp. 191–194*).—Bodily activity and diet, the author concludes from a summary of data and the results of his experiments with animals, are the principal conditions which affect diurnal variations in body temperature.

The toxicity of the primary products of digestion and the influence of certain foods upon muscular contraction, U. Mosso (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, *5. ser.*, *16* (*1907*), *No. 5*, *pp. 351–358*, *figs. 10*).—The ergographic experiments reported indicate that muscular power diminishes during the early stages of digestion, the depression varying with different foods. This effect, in the author's opinion, is caused by the action of the products of digestion upon the central nervous system and muscles.

Behavior of phytin in the organism, O. HORNER (*Biochem. Ztschr., 2 (1907), pp. 428–434; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 532, II, p. 118*).—From experiments with dogs it was concluded that 35 per cent of the phosphorus of phytin was absorbed. Similar results were obtained with rabbits, but the experiments were not complete.

The formation of glycogen in muscle, R. A. HATCHER and C. G. L. WOLF (*Jour. Biol. Chem., 3 (1907), No. 1, pp. 25–34, pl. 1, fig. 1*).—According to the authors' summary of their elaborate investigations, "glycogen is not formed in the perfusion of muscle by blood containing saccharose. Muscles rendered free from glycogen by starvation and strychnin do not form glycogen either from glucose or from saccharose. Glucose does form glycogen in muscle. The content of glycogen in symmetrical muscles is practically alike."

The fixation of creatin in muscle, F. URANO (*Beitr. Chem. Physiol. u. Path., 9 (1907), No. 3-4, pp. 104–115, figs. 4*).—The experiments reported showed that living muscle differed markedly from dead muscle in respect to the possibility of removal of creatin by dialysis, practically all of the creatin in the fresh muscle being in a form which could not be thus separated. When muscular tissue is cooked, free creatin is rapidly formed and much the same result is noted when the muscular tissue is kept on ice. It would seem therefore that some of the post-mortem chemical changes, grouped under the head of rigor mortis, are related to the differences in the way the creatin is bound to the muscular substance. Apparently in the living tissue the creatin is an integral part of the muscle protoplasm.

Creatinin and the reactions of sugar in urine, H. MCLEAN (*Bio-Chem. Jour., 2 (1907), No. 4, pp. 156–173*).—As shown by the experimental data reported, "creatinin is the substance in normal urine which most markedly interferes with Fehling's reaction in the presence of small amounts of sugar. Creatin, if present, has a similar, though less marked effect."

It is owing to the influence of creatinin that "normal urine reduces Fehling's solution after prolonged boiling, and clears up many reactions in which a precipitate appears after boiling for some time with Fehling's solution."

On diurnal and nocturnal variations in the excretion of uric acid, J. B. LEATHES (*Jour. Physiol., 35 (1906), No. 1-2, pp. 125–130, dgms. 2*).—The low output of uric acid and creatinin which was observed during the night "must be the expression of a diminished functional activity in some other organ or organs than the kidney. Nor does it seem probable for the same reason that the explanation is to be found in diminished blood pressure." The author states that experiments are now being carried on with a view to identifying the functions associated with the output of uric acid.

ANIMAL PRODUCTION.

Licensed concentrated feeding stuffs, 1907, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Bul. 149, pp. 19–25*).—A list is given of 86 brands of concentrated commercial feeds licensed for sale under the State law, together with their guaranteed protein and fat content. Some general suggestions are made for the purchase of concentrated feeds.

Comparative value of commercial feeding stuffs, V. RENNER (*Vrtljschr. Bayer. Landw. Rat., 11 (1906), No. 4, pp. 824–828*).—The author attempts to calculate on a money basis the comparative value of different feeding stuffs.

The substituting value of different concentrated feeding stuffs, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 13 (1907), No. 16, pp. 485–487*).—It is frequently necessary or desirable to substitute one concentrated feed for another in rations for farm animals, and the relative values of such materials are discussed and a table given showing the equivalent amounts of a number of varieties.

Experiments on the nutritive value of the nonproteid nitrogenous constituents of hay, M. Müller (*Jour. Landw., 55 (1907), No. 1–2, pp. 123–141*).—In continuation of earlier work (E. S. R., 17, p. 684), the amid products obtained from hay by extraction with water and purification with alcohol were studied in comparison with blood albumin in experiments with dogs. Judging by the gains in nitrogen and other recorded data, there was little difference in the two rations, and the author concludes that such nonproteid nitrogenous constituents of hay may be used for tissue building in the body and so may replace protein.

Additional experiments on the nutritive value of amids, M. Müller (*Fühling's Landw. Ztg., 56 (1907), No. 7, pp. 219–239*).—In a series of experiments subsequent to those reported above, the nitrogen gains on the amids occurring in hay were about twice as large as on free asparagin and about the same as on blood albumin. When such factors are taken into account, the author believes that amids can not be considered as having no nutritive value and that they must be grouped with protein rather than with the carbohydrates, as has been proposed.

The use of town refuse in animal feeding, Herter (*Deut. Landw. Presse, 34 (1907), Nos. 25, pp. 207, 208; 26, pp. 214, 215; 27, pp. 222, 223; 28, pp. 232, 233; 29, pp. 241, 242; 30, pp. 249–251; 31, p. 261*).—A summary and discussion of data regarding the value of food refuse and of municipal sewage-farm grass, and related questions.

Dried beet pulp molasses and denatured sugar in the feeding stuff of farm animals, Bouchon (*Sucr. Indig. et Colon., 69 (1907), No. 18, pp. 494–501, fig. 1*).—A summary and discussion of data on the use of sugar-beet products in the feeding of farm animals, with a description of the apparatus for drying beet pulp.

Molasses feeds, A. Schlicht (*Illus. Landw. Ztg., 27 (1907), No. 24, pp. 218–220*).—A summary of data regarding the composition and food value of molasses feeds. The author insists that the manufacturers should give definite data regarding the composition and quality of their products.

Materials employed to denature sugar for use in feeding farm animals (*Betterave, 17 (1907), No. 422, p. 113*).—Salt, oil cakes, meat meal, fish meal, and fish guano are among the products recommended for this purpose.

Maize as a fodder and silage crop, E. J. Russell (*Jour. Bd. Agr. [London], 14 (1907), No. 1, pp. 14–22*).—In a general summary and discussion of maize with reference to the needs of English cattle raisers, the author points out that large crops of this cereal can be grown in a number of districts in England.

In general the composition of maize somewhat resembles that of grass; "it depends on the season and is least satisfactory in cold, wet seasons when the crop is small, and most satisfactory in hot, dry ones when the crop is large. All classes of stock take to maize, and it is well worth a trial where succulent fodder is wanted during September.

"Maize can be converted into silage, which is quite a useful food, though inferior to roots and mangolds. In the process of manufacture the loss of dry matter was found to vary between 30 and 40 per cent, which loss falls mainly on the nitrogen-free extract and least on the fiber. Except when mangolds are unusually costly, it hardly appears worth while growing maize for the production of silage."

Analysis of ensilage from Biggenden State Farm, J. C. Brunnich (*Queensland Agr. Jour., 18 (1907), No. 4, p. 199*).—The samples of corn and of sorghum silage analyzed were 8 months old. The degree of acidity which was found was rather higher than usual, which, in the author's opinion, may be due to the fact that the quantities ensiled were small.

Concerning spoiled peanut cake, A. GRÉGOIRE, HENDRICK, and E. CARPIAUX (*Bul. Agr. [Brussels], 22 (1906), No. 7, pp. 953–974*).—Data are summarized regarding the composition and quality of spoiled peanut cake and its effect when fed. From the authors' analyses the conclusion was reached that spoiled peanut cake contains less than 6 per cent sugar in its organic material other than fat, and that the fat has an acidity greater than 60 per cent, calculated as oleic acid.

Yebb nuts from Somaliland (*Bul. Imp. Inst., 5 (1907), No. 1, pp. 19, 20*).—An analysis was made of the kernel of so-called yebb nuts, which indicated that they were likely to prove a satisfactory feeding stuff, since they contained about 13 per cent protein, of which nearly 12 per cent was true protein, in addition to some 10.8 per cent oil and 61 per cent carbohydrates. The nuts are used by natives as food. It was not possible to determine the botanical name.

Oil beans from southern Nigeria (*Bul. Imp. Inst., 5 (1907), No. 1, pp. 10–14*).—The proportion of oil present in oil beans or owala beans (*Pentaclethra macrophylla*) from southern Nigeria, the physical characteristics of the oil, and the composition of the meal remaining after the extraction of the oil are reported. The conclusion was drawn that there seemed no likelihood in the near future of a profitable market for these beans.

Blue agave as a famine fodder, J. M. HAYMAN (*Rpt. Agr. Sta. Orai, Jalaun [India], 1906, pp. 11–14*).—Tests made with boiled leaves of blue agave (*Agave lurida*) gave fairly satisfactory results. In the author's opinion this plant, which grows on waste lands, may have considerable value as an emergency feed in times of famine, but should be supplemented by other feeds.

Leaves of the coral tree as fodder (*Agr. Gaz. N. S. Wales, 18 (1907), No. 4, p. 361*).—An analysis by F. B. Guthrie of the leaves of the coral tree (Erythrina) is reported. The tree thrives in many localities, carries large quantities of foliage, and is readily propagated from cuttings. It has been suggested that the leaves might prove of value as stock feed during times of drought.

The water hyacinth [as a fodder] (*Queensland Agr. Jour., 18 (1907), No. 4, pp. 207–209*).—In a discussion of water hyacinth destruction and related questions a brief note is given on its feeding value. The concensus of opinion seems to be that this is not great.

Recent investigations on the feeding of farm animals, O. KELLNER (*Braunschweig. Landw. Ztg., 75 (1907), No. 12, pp. 51–55*).—In a paper presented before the general meeting of the Brunswick Central Agricultural Society, the author gives a summary and discussion of recent experiments in the feeding of farm animals.

Concerning the effect of different foods upon the structure of organs in the goose with special reference to food and functional activity, E. SCHEPELMANN (*Arch. Entwickl. Mech. Organ., 21 (1906), No. 3, pp. 500–595; 23 (1907), No. 2, pp. 183–226, figs. 47*).—The results of an extended series of investigations are reported in which geese were fed meat, grain, and mash.

The investigations as a whole, in the author's opinion, show that food may modify body structure and the functional activity of different organs. For instance, the pancreas in geese fed meat showed more marked development than in geese fed the other rations. The oil glands of geese fed the mash were somewhat heavier than those fed whole grain and about twice as heavy as those fed meat. In the case of the meat-fed geese the glands contained only a minute quantity of oil, which is probably explainable by the lack of fat in the meat diet. Extended bibliographies accompany the report.

Effect of partial starvation followed by a return to normal diet, on the growth of the body and central nervous system of albino rats, S. HATAI (*Amer. Jour. Physiol., 18 (1907), No. 3, pp. 309–320, fig. 1*).—In so far as the weight of the body and central nervous system are concerned the author concludes from the investigations reported that the effect of a 3 weeks' period of partial starvation on albino rats 30 days old is eventually completely compensated. "The chemical composition of the brain and spinal cord is, however, not entirely free from the effect, as is indicated by the higher percentage of water, and lower percentage of ether-alcohol extracts, in the experimental rats as compared with the controls."

Denatured sugar in the fattening of farm animals, H. LEGRAS (*Betterave, 17 (1907), No. 425, pp. 169, 170*).—Draft oxen fed denatured sugar as part of the ration in a 45-day test made an average daily gain of 1.516 kg. per head per day as compared with 1.352 kg. in the case of steers fed a linseed-cake ration without the sugar.

Fattening cattle on pasture, M. RASQUIN (*Jour. Soc. Agr. Brabant et Hainaut, 52 (1907), No. 18, pp. 505–508*).—A summary of data on the possibilities of fattening of cattle on pasture.

The use of skim milk in the fattening of calves, MALPEAUX (*Jour. Soc. Agr. Brabant et Hainaut, 52 (1907), No. 16, pp 459–461*).—A summary of recent data on the importance of skim milk in calf feeding when rightly used. Among other topics the hygienic value of the lactic acid of sour milk is considered.

Leaves as a sheep feed, H. ISAACHSEN (*Ber. Norges Landbr. Hoiskoles Virks., 1905–6, pp. 216–220*).—According to the author's analyses aspen leaves had the following percentage composition: Water 9.06, total protein 13.13, amids 0.80, fat 5.64, nitrogen-free extract 45.95, crude fiber 18.52, and ash 7.70 per cent. The percentage composition of birch leaves was water 9.03, total protein 12.22, amids 0.69, fat 9.05, nitrogen-free extract 48.20, crude fiber 17.21, and ash 4.29 per cent. Of the total protein of the aspen leaves 12.33 per cent was true protein and 7.32 per cent digestible protein. Similar values in the case of the birch leaves were 11.53 and 5.42 per cent. According to the author, 1 to 1.2 kg. of mixed poplar and birch leaves is equal for sheep feeding to 1 kg. of good meadow hay.—F. W. WOLL.

Sheep on paspalum grass, A. H. HAYWOOD (*Agr. Gaz. N. S. Wales, 18 (1907), No. 3, p. 234*).—In a brief note on Romney sheep at the Wollongbar Experiment Farm, it is stated that very satisfactory results have been obtained. The sheep mature early and produce a good fleece, the average weight being about 7 lbs. of wool. The carrying capacity of paspalum grass, "at a very low estimate, may be put at 10 sheep to the acre. Farmers in the district who have tried this breed speak very highly of them."

An experiment in feeding pigs, E. VOGLINO (*Coltivatore, 53 (1907), No. 15, pp. 456, 457*).—A brief note on gains made by two sows fed a mixed ration.

Different quantities of skim milk for pigs fed the same feeding stuffs, KLEIN (*Milchw. Zentbl., 3 (1907), No. 4, pp. 137–149*).—In 21 weeks the greatest gain, 0.611 kg. per head per day, was made by the pigs receiving the greatest quantity of skim milk, and the smallest gain, 0.582 kg. per head per day, was made on the smallest skim milk ration. A lot fed fish meal in addition to skim milk and grain gained 0.608 kg. per head per day.

Feeding experiments with dried potatoes, GAUL (*Deut. Landw. Presse, 34 (1907), No. 40, p. 325*).—From a feeding experiment with pigs, which is briefly reported, the conclusion is drawn that under local conditions dried potatoes may be profitably fed to pigs when they do not cost more than $1.50 per 100 lbs. and freight charges are not excessive.

Cotton-seed meal for poultry, T. W. Gaw (*Breeder's Gaz., 51 (1907), No. 20, p. 1125*).—On the basis of personal experience, the value of cotton-seed meal as a part of a dry mash for poultry is pointed out.

Improvement in horse breeding, S. O. Wood (*Jour. Dept. Agr. Victoria, 5 (1907), No. 3, pp. 138–152, figs. 5*).—Recommendations which include as special features the licensing of stallions and the discouragement of the exportation of mares were formulated after a study of the horse-breeding situation at home and abroad.

Intelligent management of plantation stables, W. H. Dalrymple (*Baton Rouge: Ortlieb's Printing House, 1907, pp. 20*).—In a paper presented before a meeting of the Louisiana Sugar Planters' Association, the author discusses the purchase of mules, care of manure, foods and feeding, water supply, the adjustment of different parts of harness and related questions with special reference to the comfort of the animals and the possibilities of greater profits from good management.

Taming zebras and their use in the Kongo state, H. Ross (*Tropenpflanzer, 11 (1907), No. 4, pp. 238–244, fig. 1*).—A summary of Nys' experiments with zebras which led to the conclusion that they may be tamed and made useful draft animals.

Ostrich growing and the production of ostrich feathers in the Cape of Good Hope, A. Ménégaux (*Rev. Sci. [Paris], 5. ser., 7 (1907), No. 16, pp. 491–495*).—Methods followed in ostrich raising on a commercial scale, ostrich breeding, the collection and care of the plumes, and similar questions are considered.

DAIRY FARMING—DAIRYING—AGROTECHNY.

The testing of cows, J. L. Hills (*Vermont Sta. Bul. 128, pp. 56–88*).—From the results of a study of nearly 700 yearly records and of over 400 lactations, the following directions are given for determining readily the annual yield of cows with sufficient accuracy for every practical purpose:

"Weigh the milk of each cow for three days monthly. At the end of the year add these results and multiply by 10, making such corrections for time of calving and drying off as circumstances indicate.

"Test the milk of each cow twice or thrice yearly, using two composite samples taken as follows:

"(a) For cows calving normally in the months of September to February inclusive and due to calve again in a reasonable time: in the third and fifth; or in the third and seventh; or in the second, fifth, and seventh; or in the second, fourth, and seventh; or in the third, fifth, and seventh months after calving. The outcome is likely to be within 0.30 per cent fat of the truth nine times in ten.

"(b) For cows calving normally in the months of March to August inclusive, and due to calve again in a reasonable time: in the third, fifth, and seventh months after calving. The outcome is likely to be within 0.30 per cent fat of the truth five times in six.

"(c) For cows calving normally and tending to go dry early: in the third and sixth months after calving. The outcome is likely to be within 0.30 per cent fat of the truth nine times in ten.

"(d) For cows which have aborted: in the third and fifth or in the third and sixth months after calving. The outcome is likely to be within 0.30 per cent fat of the truth nine times in ten.

"(e) For farrow cows when their condition does not follow abortion: any combination of the fourth or fifth month's test with that of either the thirteenth or fourteenth month linked with that of any month from the seventh to the eleventh inclusive. The outcome is likely to be within 0.30 per cent fat of the truth seven times in eight.

" In each case add the results and divide by the number of tests, two or three as the case may be, for calculated average test for the year."

The bulletin contains the summarized data and discussions upon which the above conclusions are based and also gives suggestions concerning weighing, sampling, and testing milk.

Milk yield and breast girth, E. Schnabel (*Milch. Ztg., 36 (1907), No. 26, pp. 304, 305*).—A maximum yield of milk was associated with a maximum breast measure in 27 out of 40 comparisons and with a minimum circumference in 8 comparisons. Five comparative tests showed no difference.

Report of the dairy institute at Hameln, 1906, P. Vieth (*Ber. Milchw. Inst. Hameln, 1906, pp. 39*).—The results of the various lines of work are briefly summarized and determinations of the fat content of the milk of 346 herds and comparative determinations of the fat in milk by the Gottlieb and Gerber methods are reported in full.

The action of dilute acids upon casein when no soluble compounds are formed, L. L. and D. D. Van Slyke (*New York State Sta. Tech. Bul. 3, pp. 75–153, figs. 15*).—The authors started out to determine the amount of acid which would combine with casein to form a definite compound insoluble in water, but failing to find a simple chemical combination they investigated the behavior of casein when brought into contact with different acids. The general scope of the work and the principal conclusions reached are summarized by the authors as follows:

" The behavior of casein was studied (1) with four acids of different dissociating power (hydrochloric, sulphuric, lactic, and acetic); (2) with N-125, N-500, N-1000, and N-2000 concentrations of these acids; (3) for contact of different periods of time, ranging from 5 minutes to 48 hours; (4) at different temperatures (0°, 25°, and 45° C.); and (5) with dilute solutions of neutral salts (potassium chlorid and magnesium sulphate). . . .

" It was necessary first to ascertain conditions under which casein forms soluble compounds with dilute acids in order to avoid such solution. Evidence of solution was shown (1) by viscosity of solution, (2) by behavior of solution on adding alkali, such as opalescent or milky appearance or precipitation, (3) by the xanthoproteic reaction, and (4) by deviation between results obtained by conductivity and by titration methods. In case of solution, titration results are untrustworthy for measuring the amount of free acid in solution because the dissolved proteid neutralizes per se part of the alkali used for titration, and also gives up to the alkali any acid with which the proteid may have combined. Little or no solution of casein occurs even on several hours' contact at 0° C. with solutions not stronger than N-500, or at 25° C. with solutions not stronger than N-1000. Degree of solution is increased (a) by concentration of acid, (b) by increase of temperature, and (c) by prolongation of contact. The solvent action of the four acids studied was in the following order, from strongest to weakest: Hydrochloric, lactic, sulphuric, and acetic. The rate at which casein dissolves in different acids of the same normality is not proportional to the concentration of the H^+ ions, or to the dissociation, but is disproportionately great for the weak organic acids. From solutions of equal strength, the dissolved proteid takes up a larger proportion of acid than does the undissolved. . . .

"Casein takes up acids from dilute solutions. For example, 1 gm. of casein, shaken with 100 cc. of N-1000 hydrochloric acid for 3 hours, takes from the solution nearly 50 per cent of the acid. The amount of acid thus taken up is not definite and fixed, but varies (1) with the concentration of the acid, (2) with the duration of contact until equilibrium is reached, which requires some hours, (3) with the degree of agitation until equilibrium is reached, (4) with the temperature, and (5) with the kind of acid. Some acid is always taken up, however small the amount of acid used; but the acid is never completely removed from the solution, however large the proportion of casein present. . . .

"The maximum amount of acid adsorbed by a gram of casein varies almost directly with the concentration of the acid within the limits used (N-125 and N-1000) in the case of hydrochloric, lactic, and acetic acids, so that at equilibrium the ratio of acid in 1 gm. of casein to the acid in 1 cc. of surrounding solution is nearly constant. In the case of sulphuric acid the ratio increases with dilution of acid. The equilibrium ratio reached when 1 gm. of casein is treated with 100 cc. of N-500 solution at 0°, is 675 for sulphuric acid, 147 for hydrochloric, 80 for lactic, and 36 for acetic. Equilibrium is reached in 2 to 24 hours, according to (1) the acid used, (2) the temperature, and (3) the degree of agitation. The greater part of the acid reacting is generally taken up in the first half hour or hour. Increase in temperature increases the rate at which equilibrium is approached, but decreases the final amount of acid taken up, when solution of casein does not result at the higher temperature. . . .

"The acid taken up by casein may be extracted by shaking with water. The extraction continues until the equilibrium ratio (concentration of acid in 1 gm. of casein divided by concentration of acid in 1 cc. of surrounding solution) is established, and then ceases. . .

"Neutral salts (potassium chlorid and magnesium sulphate) are not adsorbed from dilute solution by casein.

"The behavior of casein with dilute acids, when no solution occurs, suggests three different explanations: (1) an adsorption compound, (2) solution of acid in casein, or (3) a hydrolyzable salt of casein. A careful application of the experimental results to each of these hypotheses indicates that the action appears to correspond in detail only with the characterisics which apply to an adsorption.

"On the basis of this explanation, the proteid precipitated when milk sours is free casein in which lactic acid is held by adsorption."

The hydrolysis of the sodium salts of casein, L. L. and D. D. VAN SLYKE (*New York State Sta. Tech. Bul. 3, pp. 154–162, figs. 2*).—"In determining the amount of alkali neutralized by casein, different indicators give different results. Phenolphthaleïn has been in most common use in such work, giving higher results than other indicators. The object of the work presented was to determine the neutral point by means of conductivity measurements in comparison with the use of phenolphthalein and alkali. Our results indicate that the sodium salts of casein hydrolyze so readily that titration with alkali does not give the true equivalent weight of the proteid. An excess of casein, as of phosphoric acid, is required to overcome the alkalinity of the hydrolyzing normal salt. The point at which the alkalinity is overcome is indicated by the attainment of minimum conductivity and corresponds roughly with the point neutral to phenolphthaleïn. Because of the extreme weakness of its acid properties, markedly greater excess of casein is required to give an acid reaction with less delicate indicators."

The numerical determination of leucocytes in milk, A. R. WARD, MARGARET HENDERSON, and C. M. HARING (*Bien. Rpt. Bd. Health Cal., 19 (1905–6), pp. 142–156*).—The methods which have been proposed for the enumeration of leucocytes in milk are briefly described, with particular reference to their comparative accuracy and value.

According to the method proposed by Stewart a diseased condition of the udder was suspected if the milk showed more than 100,000 leucocytes per cubic centimeter. A comparison of the Stewart and Doane-Buckley methods showed that the latter method invariably causes much higher counts. Thus in 66 determinations according to the Stewart method in market milk, 9 samples showed no leucocytes and the highest number was 69,960 per cubic centimeter with an average of 5,459 for all samples. A direct comparison of the Stewart and Doane-Buckley methods during which 60 determinations were made in samples of market milk, showed an average according to the latter method more than 15 times as large as by the Stewart method. In one set of comparative tests the average number of leucocytes per cubic centimeter by the Stewart method was 5,610 on the first count and 4,800 on the second count, while from the same samples of milk the average count obtained by the Doane-Buckley method was 25,820.

A series of determinations were made by means of the Doane-Buckley method on samples of the milk of individual healthy cows during which an average count of 49,000 per cubic centimeter was obtained. When repeated counts were made from a given sample of milk the results obtained by the Doane-Buckley method were much more reliable than those yielded by the Stewart method.

The Doane-Buckley method was applied to an examination of mixed milk from dairies and individual cows in those dairies showing diseased udders. It was found that the milk from the diseased cows had no recognizable effect upon the leucocyte count of the mixed milk since most of the composite counts would be regarded as entirely normal, and the highest count obtained in one dairy was 191,000 per cubic centimeter. In another dairy one cow showed a count of 4,800,000 leucocytes per cubic centimeter, while the mixed milk of the same dairy showed only 19,000 per cubic centimeter. The author concludes that "it is not possible to detect udder disease in cows by the examination of a mixed milk for number of leucocytes alone." It is also held that the presence of streptococci in milk can not be considered as a proof of mammitis and that the microscopic examination of milk for staphylococci is of doubtful value.

Emulsions, R. Lezé (*Rev. Gén. Lait*, *6* (*1907*), *No. 10*, *pp. 217-224*).—This is a discussion of the theory of emulsions with special reference to dairy products.

Investigations on milk serum, F. Landolf (*Biochem. Ztschr.*, *4* (*1907*), *No. 2–3*, *pp. 172–195*).—From the results of earlier investigations and of those reported in this article the author is inclined to believe that lactose exists in milk in combination with both nitrogenous and nonnitrogenous substances rather than in a free condition. The preparations obtained by the author show great variations as regards polarization, reduction of Fehling's solution, and fermentation with yeast.

Bacteriological examinations of milk powder, G. Grosso (*Ztschr. Fleisch u. Milchhyg.*, *17* (*1907*), *No. 9*, *pp. 312–315*).—From samples of milk powder prepared by the Just-Hatmaker process the author isolated the following microorganisms: *Bacillus brevis*, *B. subtilis*, *B. amarificans*, *B. subbutyricus*, *Micrococcus varians*, *M. corrugatus*, and *M. eburneus*.

The composition of Irish butter during the winter months, J. H. Ball (*Analyst*, *32* (*1907*), *No. 375*, *pp. 202–208*, *figs. 3*).—Thirty-nine samples of butter made near Limerick from October 6, 1906, to March 26, 1907, showed Reichert-Meissl numbers varying from 21.9 to 30.9, Polenske numbers from 1.4 to 2.5, refractometer numbers from 41 to 42.5, and saponification numbers from 220.3 to 226.9.

Gathered cream for butter making, J. A. RUDDICK and G. H. BARR (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 15, pp. 12, figs. 3*).—Suggestions are made concerning the proper handling and care of cream intended for factory butter making.

Some of the first chemical changes in Cheddar cheese, L. L. VAN SLYKE and A. W. BOSWORTH (*New York State Sta. Tech. Bul. 4, pp. 1–16*).—The authors studied the early changes taking place in the proteids of cheese and also changes in the calcium and phosphoric-acid compounds.

"Five cheeses were made at different times under the usual conditions observed in making Cheddar cheese. They were kept at 15.5° C. Determinations in cheese were made of the amounts of (1) total nitrogen, (2) nitrogen soluble at 55° C. in 5 per cent solution of sodium chlorid, (3) water-soluble nitrogen, (4) acidity of water-extract, (5) lactose, (6) total calcium and phosphoric-acid compounds, (7) water-soluble calcium and phosphoric-acid compounds, (8) calcium compounds in the salt-soluble portion, (9) calcium lactate, (10) total and water-soluble ash. . . .

"(1) The insoluble proteid of fresh cheese-curd (calcium paracasein) changes rapidly into a form soluble in 5 per cent solution of sodium chlorid at 55° C., until, in 9 or 10 hours after the cheese is put in press, the proteid, originally insoluble in the salt solution, becomes completely soluble in this solution. (2) Then the proteid soluble in salt solution changes into a form insoluble in salt solution, this change taking place rapidly at first and then gradually. (3) Proteids in water-soluble form appear to increase only slightly, if at all, until after the salt-soluble proteid has partially changed into the form insoluble in salt solution. . . .

"The calcium and phosphoric-acid compounds of cheese, insoluble at the start, become soluble until about 80 per cent of the calcium and all of the phosphates become soluble in water. This change is due to the formation of lactic acid and its action upon the phosphates of the cheese, resulting in the formation of monocalcium phosphate and calcium lactate. About 20 per cent of all the calcium in the cheese is found in the salt-soluble portion, and the proteid in this solution shows an acidity about equal to that shown by calcium paracasein."

The acidity of the water extract of Cheddar cheese, L. L. VAN SLYKE and A. W. BOSWORTH (*New York State Sta. Tech. Bul. 4, pp. 17–22*).—The acidity of the water extract of normal Cheddar cheese is attributed to monocalcium phosphate.

Chemical studies of Camembert cheese, A. W. BOSWORTH (*New York State Sta. Tech. Bul. 5, pp. 23–39*).—The bulletin is summarized by the author as follows:

"Camembert cheese can be made in the laboratory which compares very closely to the cheeses found upon the American market, to the cheeses imported from Europe, and to those worked upon by other investigators.

"The only function of the rennet in this type of cheese is to coagulate the milk.

"The bacteria are responsible for the most important chemical changes which take place in the cheese during its early history.

"The changes caused by the bacteria, directly or indirectly, are as follows:

"(a) Lactic acid is produced from milk sugar.

"(b) This acid as formed combines with some of the insoluble calcium which is present in a new cheese as phosphates and as calcium paracasein.

"(c) The lactic acid in combining with some of the calcium of the insoluble phosphates produces calcium lactate and soluble phosphates. These soluble phosphates are acid salts and increase the acidity of the cheese.

"(d) The production of lactic acid in some way, as yet not known, has an effect upon the calcium paracasein whereby it is completely changed into a form soluble in 5 per cent salt solution.

"(e) The further production of lactic acid changes this salt-soluble compound into a form insoluble in salt solution and water.

"The acidity of Camembert cheese is due mainly to two things: Paracasein and monocalcium phosphate ($CaH_4P_2O_8$).

"One of the characteristic differences in the making of Cheddar cheese and Camembert cheese seems to be the proper control of the production of the salt-soluble compound and of the subsequent change in this compound.

"Molds are responsible for that part of the ripening of the cheese in which the compact insoluble curd is changed in texture and becomes a soft creamy mass almost entirely soluble in water. This is due to enzyms produced by the molds."

Robbiole cheese of Valsassina, G. CORNALBA (*Indus. Latt. e Zootec., 5 (1907), No. 12, p. 91*).—This soft, highly prized, Italian cheese is briefly described and analyses of 2 samples are reported as follows: Water 46.56 and 45.37 per cent, fat 25.55 and 30.56 per cent, proteids 19.99 and 20.21 per cent, total ash 7.90 and 3.73 per cent, and sodium chlorid 5.80 and 1.22 per cent, respectively.

The relation of whey albumin to coagulation with rennet, S. SCHMIDT-NIELSEN (*Beitr. Chem. Physiol. u. Path., 9 (1907), No. 8-11, pp. 322-332*).—According to the author's investigations considerable so-called whey albumin is formed when rennet is allowed to act upon casein solutions. This may represent as much as 4 per cent of the nitrogen in the casein and is not dependent upon the rennet, as it may also be produced by coagulation with acids. It is looked upon as a cleavage product of the casein.

Whey albumose, E. FULD (*Biochem. Ztschr., 4 (1907), No. 4-5-6, pp. 488-499*).—The author reports the formation of a so-called whey albumose as distinguished from the whey albumin of Hammarsten during the coagulation by rennet of artificially prepared casein solutions.

Sanitary relations of the milk supply (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 111, pp. 7*).—This is a report of a committee appointed by the commissioners of the District of Columbia to investigate the local milk supply.

The report states that there is an opposition on the part of the trade to reasonable requirements, that there is proof that milk is a cause of disease, and that while Washington market milk compares favorably with the supply in other cities "there is abundant evidence to indicate that stale and infected market milk is everywhere responsible for a needless sacrifice of human life." The importance of low temperatures in keeping milk, certified milk, and the pasteurization of milk are also discussed. The committee favors pasteurization, except for milk obtained and handled by the best methods, and recommends the establishment within the District of a central plant for receiving and preparing all milk for distribution and for sterilizing milk cans and utensils.

Some suggestions are made to the public on home pasteurization and other measures designated as immediate safeguards.

The sanitary control of milk production, F. I. KAISER (*Illus. Landw. Ztg., 27 (1907), No. 46, pp. 415-417*).—This is a discussion of the more important conditions necessary for the production and sale of pure milk.

London milk, J. W. PECK (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 4, pp. 219-226*).—The author collected 101 samples of London market milk and examined them by the Gerber method and the cryoscopic method of Parmentier, concluding from his results that 68 samples had been skimmed and 89 had been watered. The average fat content of the samples was 3.66 per cent. Comment is also made on milk standards and on the improvement of milk supplies.

London milk, H. D. Richmond and C. Revis (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 5, pp. 268–272*).—The authors question the accuracy of the analytical data reported in the above article as well as the soundness of the conclusions reached.

Bacterial content of milk, Szász (*Abs. in Ztschr. Fleisch u. Milchhyg., 17 (1907), No. 10, p. 353*).—The author examined 150 samples of market milk in Budapest, finding an average bacterial content of 1,563,000 bacteria per cubic centimeter. The range was from 18,000,000 to 52,800.

Homogenization of milk, C. Istaz and G. Van Soest (*Rev. Gén. Lait, 6 (1907), No. 11, pp. 241–248*).—The literature of this subject is briefly reviewed and experiments are reported, the authors concluding that the acidity of milk is not increased by homogenization, that the chemical composition is not sensibly altered, and that if foreign fats have been added to market milk in this way the fraud has at least not been practiced on the samples examined by them. No real physiological advantages from homogenization have as yet been demonstrated.

Preservatives in milk, H. D. Richmond and E. H. Miller (*Analyst, 32 (1907), No. 374, pp. 144–154*).—The authors believe that the acidity of milk can be expressed with fair accuracy as a function of time and temperature. Between 15 and 35° C. the effect of temperature is quite regular, each rise of 10° increasing the rate of development of acid 2.075 times.

The authors have studied the effect of various so-called preservatives upon the souring of milk. The following substances apparently hastened souring: Sodium fluorid, acid-potassium fluorid, sodium sulphite, resorcin, and phloroglucin. The following had no appreciable preservative action: Phthalic acid, abrastol, sodium β-naphthol, sulphonate, and cyllin. The following had an appreciable preservative effect: Sodium benzoate, potassium benzoate, β-naphthol, salicylic acid, potassium metabisulphite, and borates.

In the authors' experiments milk kept at 30° C. became sour enough to curdle on boiling in 17 hours. The addition of 0.1 per cent of the following preservatives delayed the time of souring the number of hours indicated after each: Boric acid 10, benzoic acid 5½, salicylic acid 7½, β-naphthol 4½, and potassium metabisulphite 21. "When it is considered that the same effect can be attained by cooling the milk down a few degrees, at a cost which certainly does not exceed that of the preservative, it is evident that there is no justification for the use of preservatives in milk."

Notes are given on the detection and estimation of benzoates, β-naphthol, and boric acid.

Dairy inspection in Ireland, P. J. Howard (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 5, pp. 273–278*).—There is, according to the author, practically no dairy inspection in Ireland. The need of inspection is therefore discussed in this article and a simple system is briefly outlined.

The pasteurization and the inspection of creamery and cheese factory by-products, E. H. Farrington and E. G. Hastings (*Wisconsin Sta. Bul. 148, pp. 17, figs. 3*).—Methods of pasteurizing skim milk, buttermilk, and whey are briefly outlined and several arrangements for this purpose are described and illustrated. Suggestions are made concerning the removal of the foam from hot skim milk, and the feeding value of pasteurized skim milk is discussed. It was found experimentally that in pasteurizing skim milk by forcing steam into it about 10 per cent of water was added to the milk. Buttermilk in amounts not to exceed 5 per cent may be added to sweet skim milk and pasteurized without the mixture's curdling.

Various tests for the detection of pasteurized milk and whey are described. The potassium iodid-starch test is recommended for general use.

Disinfectants and the disinfection of dairies, K. TEICHERT (*Molk. Ztg., 21 (1907), No. 20, pp. 535–537*).—The advantages and disadvantages of various methods of disinfecting dairy apparatus and buildings are enumerated and tests of a proprietary disinfectant are reported.

Commercial products and their valuation with special reference to microscopy and technology, E. HANAUSEK (*Erdmann-König's Grundriss der Allgemeinen Warenkunde unter Berücksichtigung der Mikroskopie und Technologie. Leipzig: J. A. Barth, 1906, 14. ed., pp. XVI+930, figs. 416*).—This general treatise on the origin, valuation, and uses of commercial products, including precious stones, minerals, metals, inks, coloring matters, chemicals, and other inorganic materials, and foods, feeding stuffs, condiments, fats, oils, drugs, paper, tanning materials, leather, fertilizers, and other organic products of commercial importance, is designed as a reference handbook for use in technical and other schools and also for all who are interested in the technology of the subject and in its commercial aspects. In preparing the revision, material which has accumulated since earlier editions has been incorporated and the volume as a whole constitutes a valuable reference work.

Cider making in France, D. I. MURPHY (*Mo. Consular and Trade Rpts. [U. S.], 1907, No. 319, pp. 209–211*).—A brief description of the methods of cider manufacture, together with varieties of apples used for this purpose in France.

On the cause of the turbidity of wines, N. PASSERINI (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 3 (1906), No. 4, pp. 365–373*).

VETERINARY MEDICINE.

Abstracts of work done in the laboratory of veterinary physiology and pharmacology, IV, P. A. FISH (*Ithaca: N. Y. State Vet. Col., 1907, pp. 67, figs. 3*).—The influence of sodium benzoate upon digestive fluids and upon metabolism was investigated by P. A. Fish (pp. 3–25 and 53–65). The digestion of starch and cane sugar was not greatly influenced by the presence of sodium benzoate to the extent of 0.5 per cent. The digestion of proteids was almost entirely checked by 1 per cent sodium benzoate. Large amounts of this drug increased metabolism and if continued may produce disturbances by interfering with the action of the liver.

In experiments with nuclein, L. S. Bachus (pp. 26–36) found that this substance causes a rapid increase in the number of white blood corpuscles, affecting the red cells to a slight extent and showing weak germicidal properties.

Experiments were carried out by P. A. Fish (pp. 37–41) to determine the physiological effect of arecolin hydrobromid. These experiments have already been noted from another source (E. S. R., 18, p. 98). Barium chlorid was tested as an antidote for nux vomica (pp. 42, 43). It was found to give almost immediate relief after the administration of fatal doses of nux vomica. About 15 grains of barium chlorid injected intravenously was necessary to counteract the effect of 4 gm. of nux vomica.

C. L. Roadhouse and L. Giltner carried on experiments to determine the value of bovine serum in cases of glanders (pp. 44–50). The blood serum of healthy cattle was used, and it was found that this serum caused no injurious effects aside from a slight reduction in the number of red blood corpuscles. The serum apparently imparts some power of resistance to glanders virus and therefore has value as a means of diagnosis, but is not capable of curing glanders.

Report on the investigations and work of the government veterinary service for 1904–5 (*Verslag. Bevind. en Handel. Veeartsenijk. Staatstoezicht,* *1904–5, pp. 246*).—A list is given of the names of veterinarians connected with the government service in Netherlands. The larger part of the report is occupied with a general account of the sanitary condition of animals throughout the kingdom with particular reference to the prevalence of tuberculosis, influenza, strangles, tetanus, hog cholera, gid, intoxications, etc.

A treatise on surgical therapeutics of domestic animals, P. J. CADIOT and J. ALMY, trans. by A. LIAUTARD (*New York: W. R. Jenkins, 1906, pp. XV+580, figs. 118*).—The translator of this volume considered the French edition as containing in a satisfactory form the information necessary to a thorough understanding of surgical therapeutics of domestic animals. The literature along this line in English is quite limited and the need was, therefore, felt for the translation.

The volume contains a general account of surgery, a special discussion of diseases common to all the tissues and diseases peculiar to certain tissues, particularly the extremities.

Veterinary toxicology, J. A. NUNN (*New York: W. R. Jenkins Co., 1907, pp. VII+191*).—The purpose of the present volume is to furnish a reliable compilation of material from all known sources regarding the effects and antidotes of the various mineral, animal, and vegetable poisons which may be of importance in veterinary medicine. The volume includes an account of general toxicology and the identification of poisons, and special chapters on metallic poisons, alkaline metals, mineral acids, gases, vapors, vegetable alkaloids, ergot, and other poisonous substances.

Meat inspection. As it is of interest to the State of Missouri, D. F. LUCKEY (*Mo. Bd. Agr. Mo. Bul., 5 (1907), No. 12, pp. 11*).—The purposes of meat inspection are to prevent the sale of diseased meat and the consequent spread of animal diseases, and to require cleanliness and hygienic methods in handling, preserving, and shipping meat and meat products intended for food. The chief results obtained by federal meat inspection are briefly noted, and attention is called to the duties of the State in supplementing the work done by the Bureau of Animal Industry.

The influence of pressure on the resorption of fluids in the subcutaneous connective tissue, M. H. J. C. THOMASSEN (*Inaug. Diss., Univ. Bern, 1906, pp. 54, figs. 2*).—The purpose of the experiments which constitute the basis for this dissertation was to determine the effect of pressure upon the rate of resorption of fluids injected under the skin. The author's experiments were carried out on young calves and the chemical substances used in solution in producing an edematous condition were nitrate, chlorid, and iodid of sodium.

It was found that when a mixture of equal volumes of sodium nitrate and chlorid in a solution isotonic with the blood was injected into the subcutaneous connective tissue, the rapidity of the blood current was diminished. When a sodium-nitrate solution was injected under increased pressure the rate of resorption into the blood was considerably increased, although, as already indicated, the blood current is somewhat slower. These results, therefore, indicate that in the resorption into the blood of fluids in the subcutaneous connective tissue the chief factors are diffusion, filtration, and osmosis.

The occurrence of eosinophilous leucocytes in inflammatory foci of the skin, C. TROESTER (*Ztschr. Veterinärk., 19 (1907), No. 4, pp. 153–156, figs. 2*).—The material which the author examined included sections of the skin of horses which had been cauterized shortly before preservation. In preparing the material the skin and underlying tissues were accidentally separated from one another. A microscopic study of sections taken 10 mm. from the cauterized point showed that the outer skin was normal while the Malpighian layer was somewhat thickened and showed a dissolution of the cell nuclei.

Second interim report of the royal commission appointed to inquire into the relations of human and animal tuberculosis, N. Foster et al. (*London: Roy. Com. Tuberculosis, 1907, pt. 1, pp. 98; abs. in Jour. Roy. Inst. Pub. Health, 15 (1907), No. 3, pp. 168–171*).—The royal commission was directed by the King of England to investigate and report on whether tuberculosis in animals and man is one and the same disease, whether it may be reciprocally transmitted, and under what conditions, if at all, such intertransmission occurs.

In the course of the investigations outlined in this report, which includes also a summary of previous investigations by the commission, tuberculous material has been used from 30 cases in cattle and 60 in man. The material thus obtained was employed in the form of emulsions or pure cultures in feeding experiments and by subcutaneous, intravenous, and intramammary inoculation. Both the bovine and human tuberculous material was tested on cattle and various other animals including guinea pigs, rabbits, rats, cats, dogs, goats, pigs, and monkeys.

Particular attention is given to the morphological and cultural variations observed in the tubercle bacilli as obtained from different sources. All of the details of these experiments of interest to investigators are given in an appendix to the report. The general result of the investigations thus far carried out indicate that "there can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis; and there also can be no doubt that in the majority at least of these cases the bacillus is introduced through cow's milk. Cow's milk containing bovine tubercle bacilli is clearly a cause of tuberculosis and of fatal tuberculosis in man." In fact, in 14 out of the 60 cases of tuberculosis in man, the tubercle bacillus proved to be of the bovine type.

Human and bovine tuberculosis, with special reference to treatment by special kinds of tuberculin, N. Raw (*Tuberculosis, 6 (1907), No. 4, pp. 198–205*).—The author adheres to his view set forth in 1903 that human and bovine bacilli are two distinct types of a common species. This view has received confirmation, in the author's opinion, during the observation of 4,000 cases of pulmonary tuberculosis in man and a study of the origin of these cases.

It is maintained that tubercle bacilli of the human type produce pulmonary phthisis and ulceration of the intestines and abdominal glands, while bacilli of the bovine type produce tubercular peritonitis, tubercular meningitis, tuberculosis of the lymphatic glands, bones, and joints, and probably lupus. Acute miliary tuberculosis is also believed to be of bovine origin. The author holds that man is susceptible to both types of the bacilli and that bovine tuberculosis is frequently transmitted to man in infected food and by contagion. It is also held that the two forms of tuberculosis are somewhat antagonistic to each other so that a mild attack of one offers protection against the other. It has been found that tuberculin from man has a marked curative effect in bovine lesions and vice versa.

The danger from tubercle bacilli in the environment of tuberculous cattle, E. C. Schroeder and W. E. Cotton (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 99, pp. 24*).—The investigations reported in this paper were undertaken for the purpose of determining the extent to which tuberculous cattle may distribute tubercle bacilli in their milk, feces, or by other means. It was found that tubercle bacilli are readily disseminated in the feces. In fact the feces are considered the most dangerous factor in the spread of tuberculosis. Tubercle bacilli are present in the feces not only of cattle showing clinical symptoms of tuberculosis but also of cattle so slightly affected that the tuberculin test is required for diagnosis of the disease.

It was found that when cattle are fed material containing tubercle bacilli the micro-organisms are passed through the body and appear in the feces. The nasal discharge and the urine were found to be free from tubercle bacilli. In the opinion of the authors, milk from tuberculous cows does not contain tubercle bacilli, at least, as a rule, until the udder and structures connected with it are affected. In stables where tuberculous cows are kept, however, the feces contain sufficient tubercle bacilli to infect the milk in nearly all cases from the dust of the stable unless special precautions are taken.

It was shown that the feces of tuberculous cows contains sufficient tubercle bacilli to render milk pathogenic even when minute quantities of the feces are added to the milk. On account of the great danger from the spread of tuberculosis through the agency of the feces, it is recommended that all dairy cows be periodically tested with tuberculin and that all reacting cattle, regardless of their condition of health, be separated from healthy cattle and not used for dairy purposes.

Primary tuberculosis of the lungs and bronchial and mediastinal glands in young calves due to the ingestion of tuberculous virus, A. Chauveau (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 15, pp. 777–783*).—In connection with the evidence presented by recent investigators that pulmonary tuberculosis in animals and man may arise from infection through the alimentary tract the author calls attention to certain investigations which he made from 1868 to 1874 in which pulmonary lesions were brought about by the ingestion of tubercle virus without the production of any pathological conditions in the alimentary tract.

Inoculation of blindworms and snakes with human tubercle bacilli, J. Sorgo and E. Suess (*Centbl. Bakt. [etc.], 1. Abt., Orig., 43 (1907), Nos. 5, pp. 422–432; 6, pp. 529–547*).—In the long series of experiments carried out by the authors, human tubercle bacilli were found to cause true infection in blindworms and snakes. As a rule, tubercle bacilli of human origin did not become modified so as to produce an infection in warm-blooded animals. The author believes that occasional modification of this sort is a mutation in the sense of de Vries and that under ordinary conditions the tubercle bacilli from human beings and from warm-blooded animals are quite distinct.

The distribution of iodin in tuberculous animals, O. Loeb and L. Michaud (*Biochem. Ztschr., 3 (1907), No. 2–4, pp. 307–314*).—Several investigators have sought to obtain evidence regarding the question whether pathological processes exercise any specific attraction for drugs. In order to obtain some experimental data on this point the authors administered potassium iodid to rabbits after having previously inoculated them with tubercle bacilli. It was found that more iodin was stored up in the tubercles than in the healthy tissues. Similar results were obtained in experiments with guinea pigs. It appears, therefore, that tuberculous tissue has a high power of absorbing iodin combinations. The iodin thus absorbed is not in insoluble organic combination.

Taking samples of sputum by means of tracheotomy in diagnosing tuberculosis, A. A. Overbeek (*Tijdschr. Veeartsenijk., 34 (1907), No. 6, pp. 371–375*).—The author reports that in cattle suspected of being tuberculous, the use of a trocar inserted through the rings of the trachea will enable the operator to obtain bronchial slime which may be at once examined for the presence of tubercle bacilli. This method is recommended in examination of cattle intended for transport, in making a differential diagnosis between tuberculosis and pleuro-pneumonia, in examining dairy cattle and calves, and also calves used for the production of vaccine.

The etiology and vaccination for tuberculosis, A. Calmette (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 3, pp. 129–135*).—Apparently no domestic animal or man is entirely immune to tuberculosis. The opportunities for becoming infected, particularly by the ingestion of tubercle bacilli, are frequent, and on this account the author looks forward hopefully to the further perfection of a method of vaccinating animals and man against the disease.

Recent work on the etiology of tuberculosis and vaccination for that disease, H. Vallée (*Ann. Méd. Vét., 56 (1907), No. 4, pp. 205–221*).—The essential points established by recent investigation of tuberculosis are presented in a critical review. In the author's opinion it has been established that vaccination against tuberculosis is possible and credit is given to von Behring for being the first to demonstrate this fact.

Anthrax or charbon, W. H. Dalrymple (*Louisiana Stas. Circ. June, 1907, pp. 4, figs. 2*).—An account is given of the etiology, transmission, spread, period of incubation, symptoms, course, diagnosis, and treatment of anthrax.

Osteomalacia and rachitis of domestic animals, Liénaux (*Ann. Méd. Vét., 56 (1907), No. 4, pp. 193–200*).—Osteomalacia is observed in cattle, goats, sheep, and horses and may be produced by inoculation in small laboratory animals. Rachitis is known to occur in nearly all species of animals. Within recent years some evidence has been presented tending to show that these diseases are of infectious origin. Many cases have occurred in which no other reasonable explanation could be offered. It is believed, however, that the classical causes usually assigned for osteomalacia and rachitis may be predisposing factors in the production of these diseases.

Pseudofarcy among cattle in Sumatra, A Vryburg (*Rec. Méd. Vét., 84 (1907), Nos. 1, pp. 31–39; 7, pp. 241–248*).—According to the author's experiments, horses and chickens are refractory to this disease, while sheep, rabbits, and guinea pigs show a more or less intense reaction after inoculation with virus obtained from cattle. The natural mode of infection is not known with certainty. It appears that contact is not necessary to produce an infection. Serum obtained from immunized animals may be used in turn to immunize healthy animals, and after such immunization there is no necessity of isolation. Iodid of potash has no influence on the progress of the disease.

The toxin of the blackleg bacillus, P. Eisenberg (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 12, pp. 613–615*).—In experiments with rabbits and guinea pigs the author demonstrated that toxin of the blackleg bacillus may exercise its effects immediately, without a preliminary period of incubation. As a rule bacterial intoxications do not develop until after a period of incubation has been passed. Occasionally, however, the toxin acts at once in the manner of other animal and vegetable poisons.

Echinococcus in the heart of cattle and prophylactic notes, A. Pasquali (*Clin. Vet. [Milan], 30 (1907), No. 14, pp. 232–237*).—In a case observed by the author the clinical symptoms were not sufficient to permit of a reliable diagnosis. A post-mortem examination, however, disclosed the presence of echinococcus in the heart. Attention is called to the comparative ease with which the prevalence of this disease may be checked by the application of suitable prophylactic measures.

Johne's disease: A chronic bacterial enteritis of cattle, J. M'Fadyean (*Jour. Compar. Path. and Ther., 20 (1907), No. 1, pp. 48–60, figs. 10*).—Within the past few years it has been found that cattle are quite frequently affected with a chronic enteritis during which acid-fast bacteria are found in the mucous membrane of the small intestines. The bacteria have, at times, been suspected of being closely related to the tubercle bacillus. The lesions caused by them, however, are much less extensive, and inflammation is comparatively very slight. The author believes that the disease is strictly infectious, spreading from one animal to another, and recommends the careful isolation of affected animals.

The anatomy, biology, and pathological effects of Ixodes reduvius, C. K. BEINAROVICH (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 1, pp. 1–43, figs. 8*).—The life history of *Ixodes reduvius* is described in detail with particular reference to its agency in transmitting the blood parasite of Texas fever in Russia. This tick is a common parasite on cattle in Russia and is believed by the author to be the carrier of the blood parasite of Texas fever. Occasionally affected cattle are seen without any evidence of the tick, but the author believes that this is explained by assuming that such cattle had been previously bitten by ticks which had subsequently become engorged with blood and fallen to the ground.

The curative treatment of mammitis in cattle, G. P. MORETTI (*Clin. Vet. [Milan], 30 (1907), No. 12, pp. 193–196*).—The frequency with which mammitis appears in high-bred cows makes it desirable that practical means be devised for the treatment of this disease. The author reports good results from pumping filtered air into the affected quarter of the udder and upon giving hypodermic injections of chlorid of caffein combined with the administration through the mouth of iodid of potash in 20-gm. doses and the application of blisters to the outside of the udder.

Further notes on Piroplasma mutans—a new species of piroplasma in South American cattle, A. THEILER (*Jour. Compar. Path. and Ther., 20 (1907), No. 1, pp. 1–18, pl. 1*).—The author has continued his investigation of *Piroplasma bigeminum* and *P. mutans*. It appears from this study that animals which have recovered from Texas fever may be successfully inoculated with *P. mutans* at any subsequent date. This is considered as conclusive evidence that the two species are distinct. The author's observations in Cape Colony indicate that while the blue tick is instrumental in transmitting *P. bigeminum* from one animal to another, it does not carry *P. mutans*. At present it is not certain how the latter blood parasite is transmitted. It appears to be distributed widely over South Africa and Madagascar.

Control of rinderpest, G. E. NESOM (*Philippine Bur. Agr. Press Bul. 9, pp. 4–7*).—A serious outbreak of rinderpest occurred among the cattle and carabao of Occidental Negros. The method of simultaneous inoculation proved very effective in its control, but the presence of surra and septicemia made it dangerous to continue this work except in localities where the last-named diseases did not prevail. In all, 5,780 cattle and carabaos were inoculated, and of this number only 4 per cent subsequently died of rinderpest.

Septic pneumonia of calves, SCHREIBER (*Monatsh. Prakt. Tierheilk., 18 (1907), No. 6–7, pp. 299–329*).—The literature relating to this subject is critically discussed in connection with a bibliography of 81 titles. The symptoms and etiology of the disease are described, and notes are given on the results obtained from the use of a method of vaccination. The micro-organism which causes the disease is *Bacillus vitulisepticus*. The vaccination method recommended by the author has given satisfactory results in nearly all cases, and consists in the use of septicidin.

Cysticercus tenuicollis in sheep, F. CLUTTERBUCK (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 3, pp. 204–206, pl. 1*).—The life history of *Tænia marginata*, which is the adult form of the sheep bladder worm, is reviewed and suggestions are made regarding the inspection of mutton for the presence of the bladder worm and the treatment of dogs in order to prevent the further spread of this parasite.

Gid in sheep, E. J. DOMMERHOLD (*Tijdschr. Veeartsenijk., 34 (1907), No. 6, pp. 375–382*).—This disease, which occurs quite commonly in sheep and cattle, and sometimes in goats, may be cured by the removal of the parasitic worm from the surface of the brain. This is accomplished by trepanning the skull. The operation may be carried out successfully on either sheep or cattle.

An epizootic mammitis of sheep caused by bacteria, Dammann and Freese (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 12, pp. 165–170*).—An epizootic mammitis was observed in sheep on an estate where it had prevailed for a number of years. The disease commonly appeared in ewes when the lambs were about 4 to 6 weeks old. A bacterial organism was isolated from the udder of affected ewes and proved to be pathogenic when injected into the udder of healthy ewes. When, however, healthy ewes were kept in the same pen with diseased animals the infection did not spread. Notes are given on the behavior of the pathogenic micro-organism on various nutrient media.

A note on the inter-communicability of ovine and caprine variola, W. H. Flook (*Vet. Rec., 19 (1907), No. 978, p. 648*).—Brief mention is made of instances in which variola has been observed to spread from sheep to goats, or vice versa. Attention is called to the fact that in inspecting sheep or goats for the possible presence of variola, the brisket should always be carefully examined.

The histology and physiology of normal pigs' blood, W. Giltner (*Jour. Compar. Path. and Ther., 20 (1907), No. 1, pp. 18–23*).—As a basis for the study of the reactions of the blood in disease, it is necessary to establish beyond dispute all of the normal conditions which may be found in the blood. The author's observations along this line were undertaken to determine the relative number of red and white blood corpuscles, the specific gravity of the blood, the size of the red blood corpuscles, and other points. During this study, the blood of 24 normal pigs was studied and the results of the observations are presented in a tabular form.

Increasing the resistance in protective vaccination against swine erysipelas, M. Prettner (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 4–5, pp. 353–359*).—According to the experiments reported in this paper the resistance of the animal organism toward swine erysipelas becomes higher the more active the part taken by the organism in the process of immunity. The degree and duration of this resistance apparently depends upon the relation between the quantity of serum and culture used in the simultaneous method. The smaller the quantity of serum the more pronounced the active immunity which results. In the author's opinion the simultaneous method of vaccination for swine erysipelas produces an essentially passive immunity.

Trichina inspection in southern Germany, J. Böhm (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 12, pp. 221–226*).—It has been commonly reported that hogs affected with trichina are exceedingly common in southern Germany and that the disease is almost unknown in man in that region. In the author's opinion this condition of affairs no longer prevails. Notes are given on a number of outbreaks of trichina among human beings and recommendations are made regarding the sanitary supervision of farms in order to prevent the infestation of hogs with trichina.

The horse; its treatment in health and disease, J. W. Axe (*London: Gresham Pub. Co. [1907], vols. 5, pp. XIV+161–320, pls. 8, figs. 100; 6 pp. XIV+321–491, pls. 9, figs. 59*).—The four preceding volumes of this work have been already noted (E. S. R., 18, p. 583). The present volumes contain an account of ring worm, mange, and some of the intestinal parasites of the horse and a detailed discussion of the structure and diseases of the bones and muscles. Special chapters are given on diseases of the joints and feet, wounds, materia medica, and antiseptics.

Intoxication produced by dead glanders bacilli in the stomach, J. Cantacuzène and P. Riegler (*Ann. Inst. Pasteur, 21 (1907), No. 3, pp. 194–210*).—In studying the toxic effects of dead glanders bacilli, the author made use of guinea pigs as the experimental animals. Detailed notes are given on the technique of laboratory methods and on the symptoms produced by the use of the dead glanders bacilli.

It is found that dead glanders bacilli are toxic and when used in large quantities produce a rapidly fatal result, whether inoculated into the peritoneum or given through the mouth. The chief symptoms are fever, emaciation, necrosis of the white blood corpuscles, and hypertrophy of the lymph glands. Although the dead glanders bacilli produce extremely toxic effects, they are rapidly destroyed by the white blood corpuscles. The penetration of these bacilli through the intestinal walls takes place largely in the ileum and cæcum.

Glanders in 1907, R. PORCH (*Vet. Rec., 19 (1907), No. 980, pp. 681–684*).—Glanders prevails throughout England but is observed with special frequency in and around London. Since 1891 the loss of 46,898 horses has been reported from this disease alone. The author considers it an unnecessary loss since practical means for the control of the disease are known and the veterinary service is of sufficient extent to eradicate glanders provided a systematic attempt is made to do so.

Osteoporosis in animals, H. INGLE (*Jour. Compar. Path. and Ther., 20 (1907), No. 1, pp. 35–48*).—Chemical analyses were made of the bones of a number of healthy and diseased horses, mules, and jacks. From these anlayses it appears that the presence or absence of osteoporosis could be determined with certainty by the chemical composition of the bones. No micro-organism has been definitely associated with this disease, and the cause appears to be found in defective nutrition.

In the bones of horses suffering from osteoporosis there is an actual deficiency of lime and phosphoric acid, but the author proposes the theory that the abnormal condition of the bones is brought about by the use of foods not necessarily deficient in lime or phosphates, but in which the ratio of lime to the phosphoric acid is too low. This would be the case where the ration consists too exclusively of oats and corn. In such a ration the proportion of phosphoric acid to lime is altogether too high. The author suggests that in localities where animals suffer from osteoporosis farmers should avoid the use of an exclusive ration of oat-hay and corn, and should supplement the deficiency in basic materials, particularly lime, by the addition of grass-hay, or better, by the use of alfalfa.

Osteoporosis of solipeds, A. THEILER (*Monatsh. Prakt. Tierheilk., 18 (1907), No. 5, pp. 193–209, figs. 4*).—The pathological anatomy of this disease is described in detail. Osteoporosis affects horses and other solipeds of both sexes and all ages and in the form usually observed in South Africa appears not to be connected with the kind of feed used. The author believes that the lack of bone-building salts can not be considered as the cause of the disease. Inoculation experiments, however, fail to cause an infection. In advanced cases, medical treatment seems to be of no avail, but in the early stages of the disease a decided change of location and climate may bring about some improvement.

Indian equine piroplasmosis, A. J. WILLIAMS (*Jour. Compar. Path. and Ther., 20 (1907), No. 1, pp. 23–35, charts 5*).—A general account is presented of the prevalence, symptoms, course, and etiology of this disease. In treating the disease, good results are reported from the use of quinin in large doses at the outset, decreasing the dose after the first few days, and adding suitable tonics. It is desirable that animals should be kept quiet during the treatment. Thus far little work has been done in India regarding the etiology of equine piroplasmosis, and the means of transmission of the disease are not known.

A piroplasmosis of the horse in Italy, L. BARUCHELLO and N. MORI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 43 (1907), No. 6, pp. 593–604*).—A piroplasmosis which occurs during the summer months in the vicinity of Rome and has been referred to under various names, such as typhoid fever, influenza, etc., is caused by a blood parasite which may prove to be *Piroplasma equi*, but the species has not been definitely determined.

The treatment of different forms of pneumonia in the horse, M. V. DROUIN (*Rev. Gén. Méd. Vét., 9 (1907), No. 103, pp. 369–384*).—The most serious forms of pneumonia in the horse are the form which follows strangles and that commonly designated as typhoid. The author describes the symptoms which ordinarily appear in cases of pneumonia, and presents a general summary of recommendations regarding methods which have given beneficial results in different cases. The results obtained from serum treatment and vaccination are thus far not quite satisfactory, although somewhat encouraging.

The etiology of strangles in horses, L. BARUCHELLO (*Rev. Gén. Méd. Vét., 9 (1907), No. 104, pp. 433–447*).—In the various forms under which strangles occurs a staphylococcus is frequently found associated with the streptococcus which has been considered as the cause of the disease. The author found that both of these micro-organisms could easily be isolated from the blood of affected animals. Apparently the streptococcus of strangles can not be differentiated from *S. pyogenes* and the staphylococcus is also referred to as *S. pyogenes*. Mixed cultures of the two pathogenic organisms are more virulent than pure cultures of either organism taken separately. The sterile filtrate of the staphylococcus contains very toxic substances and pure cultures of the streptococcus are greatly increased in virulence by the addition of some of this toxin. The author believes as a result of his experiments and observations that the great variation in the symptoms in different cases of strangles is largely due to the result of the complex action of the two associated organisms.

Poisonous effects produced by aloes in a case of strangles, M. ALBRECHT (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 15, pp. 281–286*).—Drugs which ordinarily in medicinal doses produce well-known harmless effects occasionally induce dangerous symptoms in individual cases. Brief notes are given on the effects observed from the administration of aloes. In two cases which came under the author's observations dangerous intoxication was produced by the administration of the usual dose of aloes in cases of strangles.

Bowel lesions in the horse due to a Strongylus, A. J. BECKETT (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 3, pp. 203–206, fig. 1*).—The symptoms produced by infestation with Strongylus in the horse are vague and not characteristic. They may resemble those of colic or enteritis. As soon as the parasite worms are noticed, it is necessary to adopt preventive measures in order to check the further spread of the disease. Great importance attaches to the isolation of diseased animals, since otherwise the farm where the disease occurs may become generally infested.

Tetanus, J. L. WEBB (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 2, pp. 95–99, figs. 2*).—The cause, symptoms, period of incubation, and treatment of this disease are briefly discussed. The author recommends the prompt antiseptic treatment of all wounds in localities where tetanus is to be feared. The results thus far obtained from the use of antitetanus serum are somewhat contradictory.

The three stages in the aerobic life of the tetanus bacillus, G. ROSENTHAL (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 12, pp. 578–580*).—Distinction is made between the three stages which succeed one another in the culture of the tetanus bacillus under aerobic conditions. For a short time the bacillus retains its ordinary characters intact. Its chemical, biological, and pathogenic properties are even retained during 5 or 6 transfers. Following upon this stage there is a period during which the bacillus gradually loses its functions, but still retains, at least in many instances, the power of regaining its original pathogenic properties. In the third stage the bacillus develops as an aerobe, but has lost its original characters entirely.

Polyneuritis of chickens and beri-beri, a chronic oxalic-acid poisoning, G. MAURER (*München. Med. Wchnschr., 54 (1907), No. 15, p. 731*).—In experiments conducted by the author evidence is furnished that polyneuritis of chickens is caused by chronic poisoning with oxalic acid. It was found that when rice and other cereals were fed to excess after having the outer coat removed, the symptoms of polyneuritis developed. This is interpreted as meaning that oxalic acid is not counteracted for the reason that its natural antidote, lime, is largely removed with the outer coat of the grain.

The germicidal value of liquor cresolis compositus (U. S. P.), C. N. MCBRYDE (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 100, pp. 24*).—In the disinfection of cattle cars, the Bureau of Animal Industry has previously used a mixture of lime and carbolic acid, but on account of some objections to this disinfectant a test was made of liquor cresolis compositus, which is described as a liquid soap containing 50 per cent of cresols. This disinfectant was carefully tested by the drop and rod methods and compared with the efficiency of carbolic acid alone and a mixture of carbolic acid and lime. In these comparative tests it was found that carbolic acid was considerably diminished in germicidal efficiency by the addition of lime. The bacteria used in comparing carbolic acid and a mixture of the same disinfectant with lime were *Staphylococcus pyogenes aureus* and the hog cholera bacillus.

Liquor cresolis compositus, as described in the United States Pharmacopœia, contains 500 gm. of cresol, 350 gm. of linseed oil, 80 gm. of potassium hydroxid, and enough water to make 1,000 gm. In experiments with this mixture it was soon found that the higher the boiling point of the cresol the more efficient the disinfectant. Tests were made with a number of organisms, including *Bacillus pyocyaneus*, *B. coli communis*, *B. typhosus*, *B. tuberculosis*, and *B. choleræ*

Liquor cresolis compositus was found to be strongly germicidal for all of these bacteria. It varies somewhat in its efficiency depending on the boiling point of the cresol, but the germicidal value of the lowest form of cresol is 1½ times greater than that of carbolic acid.

RURAL ECONOMICS.

The initiative of the King of Italy and the International Institute of Agriculture, A. DE VITI DE MARCO ET AL. (*L'Iniziativa del Re d'Italia e l'Istituto Internazionale d'Agricoltura. Rome: G. Bertero, 1905, pp. X+732; rev. in Polit. Sci. Quart., 22 (1907), No. 2, pp. 348–350*).—The information contained in this treatise was compiled at the request of the King of Italy as a basis for determining the best plan and constitution of a proposed international institute of agriculture. The volume is divided into two parts. The material presented in part 1 relates to the production and distribution of agricultural products, the methods and advantages of irrigation, cooperative credit and insurance societies, agricultural organizations, and other matters bearing on the economic life of the rural population in Italy, France, Great Britain, United States, Austria, Germany, and Holland. Statistics are given in detail on these subjects up to the close of the year 1904.

In part 2 are discussed the functions of an international institute of agriculture by means of special articles on the following topics: The international development of cooperation, by A. Bertolini; the international development of insurance against damage from hail, by U. Broggi; the organization for marketing grain in the international congresses of agriculture, by G. del Vecchio; the international agricultural union and the project of Professor Ruhland, by the same writer; notes on the agricultural statistics of England and the United States, by C. Dragoni; and the agricultural migratory tendencies between various countries, and the grouping of emigrants, by A. Bosco di Ruffino.

The volume as a whole furnishes detailed information regarding the organization of agriculture in the countries mentioned.

Agricultural cooperation in Austria-Hungary, U. Paluani (*Bol. Quind. Soc. Agr. Ital., 12 (1907), No. 9, pp. 351-357*).—The author discusses the development of agricultural cooperation in Austria and Hungary from 1880 to 1906, with particular reference to the Raiffeisen agricultural credit banks, cooperative dairies, grain associations, and societies for the marketing of eggs, though numerous other forms of cooperation are mentioned.

Statistics show that there were in Austria in 1905, 4,300 cooperative credit banks, with deposits aggregating 310,000,000 crowns, while in Hungary in 1906 the number was 1,814, with 453,929 members and a capital of about 18,000,000 crowns. At the close of 1904 the cooperative dairies in Hungary numbered 584 with about 56,000 members, and the number of egg societies was 264 at the close of 1906. In no country in the world, it is said, is agricultural cooperation so completely developed, so systematically organized, and so accurately classified as in Austria-Hungary.

Danish cooperative associations for producing and marketing agricultural products, T. Brinkmann (*Fuhling's Landw. Ztg., 56 (1907), No. 8, pp. 255-273*).—Statistical data with discussion relating to the development of cooperative associations for the production and sale of milk, eggs, and meat. The figures indicate a gradual increase in the number of associations, membership, and extension of trade from 1900 to 1906. The present success of Danish agriculture and the improvement in the quantity and quality of the products are attributed in great measure to the operation of cooperative societies.

Agricultural organization in Natal (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 5, pp. 523-526*).—The organization and purposes of the mealie growers' union, fruit growers' union, wattle growers' association, and a cooperative bacon factory in Natal are reported. The general objects of the associations are to facilitate the marketing of products, to disseminate information among producers, to secure a reduction in freight rates, to supervise the inspection and grading of products, and to secure greater returns to producers by saving the profits of middlemen.

The real state of cooperative agricultural credit in France, Gilliéron-Duboux (*Chron. Agr. Vaud, 20 (1907), No. 10, pp. 203-208*).—The author points out in this article how the agricultural credit banks are aiding the peasant classes in France, particularly by furnishing credit on personal security at 4 or 4½ per cent interest.

The progress of the movement is shown by the following summary: In 1900 there were 9 district banks, 87 local banks, 2,175 members, and 1,910,456 francs advanced in loans; at the close of 1905 there were 66 district banks, 1,355 local banks, 61,874 members, and 44,162,573 francs advanced in loans. The figures for the first 6 months of 1906 also show a proportionate rate of increase.

Report on the agricultural bank of Egypt, E. W. Kemmerer (*Ann. Rpt. Philippine Com., 7 (1906), pt. 1, pp. 643–695*).—This report describes the economic conditions of the peasantry in Egypt prior to the establishment of the agricultural bank in 1902, and gives an account of its organization, control, and operation since that date. The author expresses his belief that it would be advisable to establish "an agricultural bank in the Philippines along lines similar to that of the agricultural bank of Egypt."

Cooperative banks for agriculture (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 3, pp. 245–251*).—A discussion of some of the results accomplished in promoting the economic welfare of the poorer classes of farmers and tenants by the establishment of agricultural cooperative banks.

Land banks versus credit banks, E. T. MULLENS (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 5, pp. 485–488*).—The difference in functions of land banks and credit banks and the advantages of their establishment in Natal are discussed. The former advance money on the security of freehold land to proprietors, while the latter, as mutual loan societies, primarily seek to aid tenant farmers on the basis of personal credit.

The need for farm statistics in estimating the cost of production (*Rhodesian Agr. Jour., 4 (1907), No. 4, pp. 333–344*).—This article was compiled on the basis of Minnesota Station Bulletin 97 (E. S. R., 18, p. 686), with changes made to make its facts and principles applicable to the conditions in Rhodesia.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 9 (1907), No. 8, pp. 57–64*).—Data on the condition of crops and on the supplies, value, and prices of agricultural products in the United States and foreign countries are summarized and discussed. A table gives the principal groups of domestic exports of farm and forest products during the fiscal years 1906 and 1907.

Kansas—her story and statistics (*Quart. Rpt. Kans. Bd. Agr., 26 (1907), No. 101, pp. 444, map 1*).—Detailed information of each county of the State as regards area, population, resources, railways, products, public lands, etc., with a history of the development of Kansas since 1865. The report also contains the addresses, papers, and discussions at the annual meeting of the Kansas State Board of Agriculture, January 9–11, 1907, and a résumé of commercial sugar-beet production in Kansas. The statistical data regarding agriculture have been noted from another source (E. S. R., 18, p. 1171).

Tenth report of the Bureau of Agriculture, Labor, and Industry of the State of Montana, J. A. FERGUSON and L. P. BENEDICT (*Rpt. Bur. Agr., Labor, and Indus. Mont., 10 (1906), pp. VI+478, pls. 29, figs. 25*).—This is a detailed report on the lands, irrigation, agriculture, labor, industries, and other economic and social forces of Montana for the year ending November 30, 1906.

The various agricultural industries and methods of culture practiced are described, accounts are given of the farmers' organizations, creameries, live stock, and wool production of the State, and statistics are presented and discussed for the purpose of showing the State's agricultural development which "warrant the prediction that Montana is destined in the near future to take high place among the really great agricultural States in the Union."

Annual bulletin of the Nebraska Bureau of Statistics, B. BUSH and D. C. DESPAIN (*Ann. Bul. Bur. Statis. Nebr., 5 (1906), pp. 128*).—Detailed statistical data of each county of the State covering such subjects as land values, crop production and values, shipment of various products, classifications of land and the areas thereof, census of fruits, population of towns, railway mileage, freight charges of the State in comparison with the rates in Illinois, Iowa, Missouri, and Kansas, etc. The value of products shipped in 1905, the bulk of which was of an agricultural nature, was $279,723,378.

Trade and agriculture of the Piræus and district for the year 1906, E. MACDONELL ET AL. (*Diplo. and Cons. Rpts. [London], Ann. Ser., 1907, No. 3785, pp. 33*).—In addition to statistics on the general trade relations of the Piræus for 1906, notes are given on the agricultural conditions of the district.

The peasantry of Greece are said to be remarkably poor though highly intelligent and industrious. The causes assigned for lack of progress in economic and social conditions are the want of police protection, the prevalence of malaria, the absence of agricultural banks, the lack of modern agricultural implements, and the neglect of proprietors and the government to provide for the drainage of land, the construction of roads, and the general encouragement of agriculture. Practically the only implements used in Greece are the plough, the hoe, and the reaping hook, except on the estate of the Lake Copias Company, on which modern machinery is employed. Most of this estate of 53,000 acres is worked by tenants on farms ranging from 2 to 100 acres in size, who pay a rent in kind of 20 per cent of the actual yield of produce. The wages of agricultural laborers range from £2 12s. to £3 7s. per month.

Tariffs on agricultural and animal products (*U. S. Dept. Com. and Labor, Bur. Manfr., Tariff Ser. No. 2, pp. 120*).—Tabulated schedules of tariff duties on agricultural and animal products imposed by the various countries in the world are reported.

AGRICULTURAL EDUCATION.

Report on agricultural instruction, 1904–6 (*Dept. Landb., Nijv. en Handel, Verslag en Meded. Dir. Landb., 1907, No. 1, pp. 204*).—This report contains detailed statements concerning the organization, faculty, courses of study, attendance, etc., of the agricultural institutions of different grades in the Netherlands. These include (1) the Royal Agricultural, Horticultural, and Forestry High School at Wageningen; (2) Royal Agricultural School, Royal Horticultural School, and Royal People's High School, at Wageningen, and Royal Dairy School at Bolsward; (3) royal agricultural and horticultural winter schools, and the communal agricultural winter school at Veendam, and (4) the Gerard Adrian van Swieten Horticultural School. The royal agricultural, horticultural, and people's high schools at Wageningen were formerly divisions of the Royal Agricultural School, but when, on September 1, 1904, the latter was enlarged, and became the Royal Agricultural, Horticultural, and Forestry High School, the three divisions mentioned became independent schools.

Reports are also given on itinerant courses in agriculture and horticulture, agricultural instruction for the army, work of agricultural, horticultural, and dairy instructors, courses in animal husbandry, horses and horseshoeing, the work of associations subsidized by the government, and an account of the agricultural instruction given in the armies of different countries.

Preliminary announcement concerning instruction in practical agriculture upon the university farm, Davisville, E. J. WICKSON (*California Sta. Circ. 29, pp. 8*).—This circular gives an account of the character of instruction on and equipment of the university farm, and an announcement and outlines of short courses for 1907–8.

Public industrial education, W. M. HAYS (*Amer. Mo. Rev. of Reviews, 35 (1907), No. 5, pp. 590, 591*).—This is a review of recent legislation for agricultural education and research (the Adams Act and the Nelson Amendment), and a discussion of the provisions of the pending Davis Bill to appropriate about $8,000,000 annually for industrial education in high schools of secondary grade.

Improvement of rural education in Great Britain (*County Council and Agr. Rec., 35 (1907), No. 846, pp. 132–134*).—The County Councils Association, at its meeting March 27, adopted a report of its rural education subcommittee dealing with the manner in which education in rural or agricultural subjects can best be fostered in the public elementary schools and evening schools in rural districts.

The report deals first with the nature of instruction in reading, writing, composition, arithmetic, nature study, drawing, and manual work, and maintains that all of these subjects should be taught with the idea of giving local application to the instruction. Reading, for example, should include considerable historical and geographical material of local interest. The composition should deal with nature-study work and manual training. Arithmetic should include the measurement of land, crops, stacks, cisterns, etc., the weighing of cereals and other crops, and problems in home accounts, marketing, profit and loss in the school garden, cost of cultivation, etc. Drawing should include freehand and color work with plants, as well as geometrical and scale drawing of fields, garden plats, buildings, boxes, and other objects. For the manual training work it is suggested that gardening be carried on for the purpose of studying the growth of crops in relation to the soil and to obtain skill in the operations of gardening, that there also be given opportunities for woodwork in making hencoops, garden frames, beehives, and other useful articles, and where possible, exercises in making baskets, nets, mats, etc. For the girls, needlework, cooking, household management, and elementary hygiene are recommended.

The committee emphasizes the importance of instruction in nature study and rural economy for all children, of school gardens in connection with elementary schools and continuation schools, of facilities for training teachers in rural subjects, of the organization of boys' agricultural clubs, gardening clubs, and junior naturalist societies corresponding to similar societies in this country, of making collections for school museums, and of organizing local fairs or exhibitions for the selection of appropriate material for larger agricultural shows.

Shall agriculture be taught in the secondary schools of the United States? S. A. KNAPP (*South. Ed. Rev., 4* (*1907*), *No. 1–2, pp. 53–64*).—A paper presented at the conference on secondary education in the South. Charlottesville, Va., November 22–24, 1906, in which a rather pessimistic view is taken of the possibilities for agricultural instruction in the public schools as at present organized. The speaker held that in these schools agriculture taught by the text-book method alone would be more injurious than beneficial, taught by object lessons solely the advantages would be very slight, but "taught by demonstration, each pupil being the demonstrator and working out the problems on a little farm under his exclusive control, rewarded by the success and the sale of the proceeds, would be of great value."

Agricultural education in secondary schools, W. LOCHHEAD (*South. Ed. Rev., 4* (*1907*), *No. 1–2, pp. 43–53*).—An address at the conference noted above, in which the agricultural work of secondary schools in Canada is described, with special reference to the Macdonald rural school movement.

Agriculture in high schools, D. J. CROSBY (*South. Ed. Rev., 4* (*1907*), *No. 1–2, pp. 37–43*).—A stenographic report of another address before the conference noted above. A description is given of some of the agricultural work now in progress in high schools, and sources of information and assistance for teachers are pointed out.

Pre-text-book work in agriculture for the common schools, M. A. BUSSEWITZ (*Wis. Jour. Ed., 39* (*1907*), *No. 4, pp. 142, 143*).—Suggestions for work in elementary agriculture in the years preceding the introduction of the text-book.

School training for the home duties of women. I, The teaching of domestic science in the United States of America. II, Belgium, Sweden, Norway, Denmark, Switzerland, and France (*Bd. Ed.* [*London*], *Spec. Rpts. Ed. Subjects, 15* (*1905*), *pp. 374+XV; 16* (*1906*), *pp. 352+XVI*).—Part 1 of this report includes an introduction devoted to the discussion of the scheme of public education in America, and the history and development of domestic science teaching. Following this are chapters devoted to the different phases of domestic science teaching in State institutions (primary and secondary schools, colleges, and normal schools), private institutions (elementary and secondary schools, institutions for training teachers in domestic science, technical institutes, women's colleges and universities), and social agencies engaged in promoting domestic science teaching (women's clubs, philanthropic agencies, summer schools, university extension, and the domestic service problem). Under each class of institutions there is a discussion of the kind of courses offered, such as cookery, needlework, hygiene, physiology, etc., and this is followed by brief outlines of typical courses in different schools. Eleven appendixes contain more detailed descriptions of some of the more important courses.

Part 2 consists of special articles describing the teaching of domestic science in the schools of Belgium, Sweden, Norway, Denmark, Switzerland, and France. This volume also contains tables of contents for the 15 preceding volumes of Special Reports on Educational Subjects.

Nature study as an education, Mary P. Anderson (*Nature-Study Rev., 3 (1907), No. 4, pp. 102–111*).—In this article the attitude of children toward nature-study material receives attention, and the value of nature study in developing the powers of reason and expression, in its esthetic and ethical relations to the pupils, and in affording information is discussed.

Nature study and school gardens, J. Craig (*Cornell Countryman, 4 (1907), No. 8, pp. 246–248, figs. 4*).—A brief description of the work in Canadian consolidated schools and groups of elementary schools.

The value of nature study and children's gardens, G. W. Carver (*Cornell Countryman, 4 (1907), No. 8, pp. 249, 250*).

Danish school gardens, C. Mariboe (*Haven, 7 (1907), Feb. 12, pp. 36–50, figs. 3*).—A report of the activities of the Skolehaven Society for the year 1905–6. An account of the history of the society is given, with brief illustrated descriptions of 17 different Danish school gardens.—F. W. Woll.

School gardens, P. Emerson (*New England Mag., n. ser., 36 (1907), No. 1, pp. 85–91*).—This is an account of the school garden work at the Cobbet School, Lynn, Mass., where much attention is given to a wild garden of native flowers and shrubs, gardens of cultivated plants, vegetable gardens, and cereal plats, all of which are closely related to the other school work. An effort is made to conduct the gardens on a self-supporting basis, and the way in which this is done is described.

The germination of garden and field seeds, V. H. Davis (*Agr. Col. Ext. Bul. [Ohio State Univ.], 2 (1907), No. 8, pp. 4–12, figs. 9*).—Suggestions for seed-testing exercises suitable for public school work.

An educational campaign in behalf of trees, O. J. Kern (*Forestry and Irrig., 13 (1907), No. 5, pp. 247–253, figs. 9*).—This is an account of the campaign conducted by the county superintendent of schools in Winnebago Co., Ill., during the years 1902–1906 to arouse an interest in tree planting and the decoration of school grounds.

Farmers' institute bulletin, 1906, E. R. Lloyd (*Mississippi Sta. Bul. 100, pp. 47, figs. 9*).—This bulletin contains addresses given at farmers' institutes in Mississippi and a list of regular institute workers.

MISCELLANEOUS.

Twenty-eighth Annual Report of North Carolina Station, 1905 (*North Carolina Sta. Rpt. 1905, pp. 84*).—This contains a financial statement for the fiscal year ended June 30, 1905, reports of the director and heads of departments on the work of the station during the year, and reprints of Bulletins 190–192. The report of the biological division is abstracted elsewhere in this issue (p. 150).

Twenty-ninth Annual Report of North Carolina Station, 1906 (*North Carolina Sta. Rpt. 1906, pp. 87*).—This report for 1906 is similar in form to that noted above. Bulletins 193 and 194 are reprinted. A portion of the report of the chemical division is abstracted elsewhere in this issue (p. 122).

Experiment Station Work, XLI (*U. S. Dept. Agr., Farmers' Bul. 296, pp. 32, figs. 4*).—This number contains articles on the following subjects: Wells and pure water, phosphates and soil acidity, pure seed v. poor seed, disease-resistant clover, eradication of wild mustard, sterilization of soils for preventing plant diseases, seedless tomatoes, pickling olives and mock olives, hay-box or fireless cooker, insect enemies of shade trees, feeding whole grain, improvement of cattle, ventilation of stables, hog cots, preserving eggs, and American Camembert cheese.

Development of New Caledonia, G. LAFFORGUE (*L'Elevage à la Nouvelle-Calédonie. Paris: Augustin Challamel, 1905, pp. 115, figs. 3, dgms. 2*).—The author has considered the climate and soil of New Caledonia at some length but has devoted the greater part of his monograph to a discussion of present conditions of cattle and sheep raising in New Caledonia and to the possible development of these branches of animal production.

Development of the Soudan, C. PIERRE and C. MONTEIL (*L'Elevage au Soudan. Paris: Augustin Challamel, 1905, pp. X+204, figs. 35, map 1*).—In this monograph on agricultural conditions in the Soudan the physiography of the country is considered, as well as its agricultural possibilities and present conditions. Chapters are devoted to horses, mules, and other farm animals, and to poultry, elephants, ostriches, camels, etc.

NOTES.

Alabama Canebrake Station.—J. M. Richeson has resigned as vice director and has been succeeded by F. D. Stevens, formerly of the Bureau of Soils of this Department.

Tuskegee Institute and Station.—H. G. Maxwell has resigned as dairyman.

Alaska Stations.—A station has been established near Fairbanks in the Tanana Valley on the tract of 1,400 acres reserved by Presidental proclamation for station purposes some time ago. During the summer the special agent in charge has cleared and broken ready for seeding next spring about 10 acres. A full equipment of farming implements, fencing material, seed grain, etc., has been provided, and a site selected for buildings. The location, soil, and exposure are deemed favorable to farming on an extended scale, but the plan is to clear the land as rapidly as funds will permit, operating the station along ordinary farm lines for several years in order to ascertain whether practical farming can be made successful in the region. Crops of all sorts, but more particularly grains and hay, will be grown and sold in the local markets. An account will be kept of both expenditures and receipts with a view to securing data as to profits. J. W. Neal, who carried on the work at the Copper Center Station for four years, will be in charge of the new station.

California University and Station.—Elwood Mead, professor of irrigation institutions and irrigation engineer, has been granted leave of absence until July 1, 1908, to take charge of irrigation work for the Australian government. M. E. Jaffa, of the department of nutrition and in charge of the poultry station, has been appointed director of the laboratory of the State board of health, but will retain his connection with the station work. R. H. Loughridge and G. E. Colby have returned from leave of absence in Europe. Recent appointments include W. T. Clarke as assistant professor of horticulture and superintendent of university extension in agriculture, C. Westergaard, recently of the North Dakota college, as instructor in farm mechanics, and G. W. Lyons as assistant in the division of soils in the station.

Connecticut College.—A short course in forestry is announced, to begin November 5 and continue six weeks, under the directorship of the State forester. The course will include the study of practical forest management, the reproduction, growth, and maturity of forest trees, destructive agencies in the forests and their control, and the care of Connecticut farm forests.

Connecticut State Station.—Recent changes in personnel include the resignation of Kate G. Barber, as microscopist, to accept a similar position with the Bureau of Chemistry of this Department, and the appointment of C. B. Morrison as chemist.

Delaware Station.—Miss Margaret B. McDonald, assistant chemist, has resigned to accept an instructorship in agricultural chemistry in the Pennsylvania College.

Indiana Station.—W. J. Jones, for a number of years chief deputy State chemist, has succeeded the director as State chemist and will have full charge of the feed stuffs and fertilizer inspection.

Iowa College.—Recent promotions include J. A. McLean and Wayne Dinsmore to associate professorships of animal husbandry, J. B. Davidson to a professorship of agricultural engineering, E. B. Watson to an assistant professorship of soils, and John Bower to an assistant professorship of dairying.

Kansas College and Station.—Osar Erf, professor of dairying, who has resigned to accept a similar position at Ohio State University. Other recent appointments include C. G. Elling, of the Cuban Experiment Station, as assistant in animal husbandry, E. G. Shafer in agronomy, and O. A. Stevens in botany. G. F. Freeman and G. C. Wheeler have been promoted, respectively, to assistant professorships of botany and animal husbandry. W. E. Mathewson, assistant chemist, has resigned to accept a position in the Bureau of Chemistry of this Department.

A six weeks' summer school in agriculture has been established, chiefly for teachers and similar in scope to that now given in domestic science. The veterinary science building provided for by the last legislature is in process of construction. A two-story stone structure, about 75 by 155 feet, with an auditorium annex 60 by 38 feet, is planned, to be completed by September, 1908, at a cost of about $70,000.

Kentucky Station.—E. C. Vaughn has been appointed assistant entomologist and botanist. A greenhouse to cost $10,000 is under construction.

Michigan Station.—Dr. Otto Rahn, of Halle, Germany, the author of several monographs on bacteriological subjects, has been added to the bacteriological division for work in dairy bacteriology, especially the relation of bacterial flora to the keeping qualities of milk and butter. Dr. G. A. Waterman has been succeeded as consulting veterinarian by Dr. L. M. Hurt, of the Iowa College. Dorothea Moxness, assistant chemist, has resigned to engage in commercial work.

Minnesota University.—Dr. Harold L. Lyon has resigned as assistant professor of botany to accept the assistant directorship of the pathological laboratory of the Hawaiian Sugar Planters' Station. Edward C. Johnson, assistant in botany, has been appointed assistant pathologist in this Department.

New Mexico College and Station.—Vincent B. May, of Las Cruces, has been appointed regent, vice José Lucero. Laurenz R. Greene, assistant in horticulture, has resigned to accept an assistantship at the Iowa College and is succeeded by A. D. Holloway, a graduate of the Kansas College. P. D. Southworth, assistant in animal husbandry, has resigned to enter commercial work, and S. B. Durham, a graduate of the Oklahoma College, has been appointed assistant in dairying. The live stock herd for instruction work has been materially increased. A course in farm machinery has been added, for which considerable equipment has been provided.

North Carolina College and Station.—A division of entomology has been established in charge of R. I. Smith, formerly State entomologist of Georgia.

Pennsylvania College and Station.—Hugh P. Baker, of the Iowa College and Station, has been elected professor of forestry, J. W. Clark instructor in poultry husbandry, W. H. Tomhave assistant in animal husbandry, W. R. White assistant in correspondence courses, and H. P. Fishburn assistant chemist. T. I. Mairs has been given charge of the correspondence courses. Since the beginning of the year five heads of departments and ten assistants have been added to the staff.

Rhode Island College and Station.—J. W. Bolte, assistant professor of animal husbandry and in charge of poultry feeding, has resigned to engage in commercial work. *Science* notes the appointment of Dr. L. J. Cole, chief of the investigations in animal breeding and pathology, as instructor in zoology in Yale University.

South Carolina College and Station.—R. W. Simpson, who has been president of the board of trustees since the establishment of the college, has resigned and is succeeded by Hon. Alan Johnstone. Other changes in personnel include the appointment of A. F. Conradi, of the Texas Station, as entomologist and zoologist in succession to C. E. Chambliss, whose resignation has been previously noted; M. R. Lowers, as veterinarian, in succession to L. A. Klein; and C. V. W. Cornell, as assistant chemist, in succession to W. E. Dickinson. H. D. House has resigned to take up work at the New York botanical garden.

Vermont Station.—Some investigations in the nutrition of young animals have recently been undertaken. A small building has been erected for the work.

Virginia College.—W. J. Quick has been elected dean of the college of agriculture and professor of agriculture.

Massachusetts Conference on Rural Progress.—In connection with the celebration of the fortieth anniversary of the opening of the Massachusetts Agricultural College to students, a four-day conference on rural progress was held October 2–5, 1907. Such interests as the State Board of Agriculture, the State Grange, the Massachusetts Civic League, the State executive committee of the Young Men's Christian Association, the Connecticut Valley Congregational Club, and the Western Massachusetts Library Association lent their active cooperation. The scope of the conference and the arrangement of topics are indicated in the partial summary which follows. The conference is also noted editorially in this issue.

The conference opened with an anniversary program, papers of a reminiscent and historical nature being delivered by Hon. M. F. Dickinson and W. H. Bowker, of the board of trustees. Director Brooks summarized the twenty-five years of experimental work at the college and outlined the function and aims of the station. At the afternoon session, C. L. Beach, of the Vermont University and Station, gave an address on Dairying, and N. J. Bachelder, master of the National Grange, spoke on The Grange and Rural Progress. The dedication of Clark Hall, the substantial botanical building in process of construction, followed, with addresses by Profs. D. P. Penhallow, of McGill University, and J. M. Tyler, of Amherst College, on the life and work of former President Clark, for whom the building was named. In the evening Dr. A. C. True, of this Office, spoke on The Broad Outlook of the Experiment Stations, and President Carroll D. Wright, of Clark College, on The Value of Art and Skill in Industry.

On the second day, State Forester Rane discussed The Forestry Situation in Massachusetts and Prof. John Craig, of Cornell University, Cooperation in Marketing Farm Products. The remainder of the day was devoted to a discussion of civic improvement, with addresses in the evening by J. R. Boardman, of the International Committee of the Young Men's Christian Association, on The Country Boy in Service, and by Henry Turner Bailey, of Worcester, on An Interpretation of the Civic Improvement Campaign in America.

The third day of the conference dealt especially with the rural library, church, and school, with an illustrated lecture by O. J. Kern, superintendent of schools of Winnebago County, Illinois, on The Front Line of Country School Improvement. Dr. G. E. Stone, of the college, discussed The Care of Shade Trees, and Prof. J. E. Rice, of Cornell University, Some Poultry Questions.

Saturday, the final day, was devoted largely to the interests of schools. The speakers included Mr. Kern on The New Agriculture in the Country School; Dr. K. C. Davis, of the St. Lawrence University School of Agriculture, on What Agricultural High Schools are Doing; Charles H. Morse, of the Massachusetts Commission on Industrial Education, on The Problem of Industrial Education; and George H. Martin, secretary of the State Board of Education, on Some English Experiments in Agricultural Education.

Kansas City Meeting of the American Veterinary Medical Association.—The forty-fourth annual meeting of this association was held in the New Casino in Kansas City, September 10–13, 1907. The attendance was larger than at any previous annual meeting and the interest shown by members and visitors was particularly gratifying. Among the special features was a visit to the Armour packing plant for the purpose of inspecting the methods of slaughtering and of curing and preserving meats, and for studying the unusually large and complete collection of pathological specimens taken during the regular routine of meat inspection by the agents of the Bureau of Animal Industry. On the last day of the meeting a clinic was held at the Kansas City Veterinary College, where a variety of surgical operations was performed.

As in previous years the various State secretaries made reports on the condition of veterinary practice in their respective districts and on the most prevalent outbreaks of animal diseases occurring during the year. A paper by A. Liautard directed attention to some of the difficulties at present encountered by the recent graduates of veterinary colleges. The necessity for uniformity in the requirements for matriculation, graduation, and curricula because of differences in the requirements of State examining boards was pointed out and it was urged that the veterinary schools should cooperate in establishing a standard of veterinary education. In a discussion of the paper Doctor Melvin justified the present Civil Service examinations and the six months' probation period in the appointment of inspectors.

D. A. Hughes discussed the place of veterinary medicine in State education. It was agreed that good veterinary courses should be established in all agricultural colleges. The importance of animal industry at the present time justifies the idea of providing proper instruction in each State for such students as may wish to become veterinarians. No veterinary school can be properly equipped and maintained without endowment, and this should preferably come from the State.

The present status of veterinary education in Europe was discussed at length by P. A. Fish, on the basis of observations made during a recent trip to some of the important European schools, particular attention being given to facilities and equipment of the veterinary schools of England, Scotland, Holland, Germany, Switzerland, and France.

A. H. Baker presented an account of intestinal obstruction in the horse. Acute cases rapidly prove fatal; subacute cases slowly recover or prove fatal in about two days. Acute cases may be due to an intestinal calculus, volvulus or intussusception. Subacute cases are caused by the formation of hair-balls, bots, parasitic worms, or tumors. Among the drugs which were found most successful in treating these cases mention was made of linseed oil, eserin, *Cannabis indica*, chloral hydrate, atropin, etc. Neither opium nor aloes should be used.

The effect of tuberculin upon milk production was discussed by S. H. Gilliland, who presented data of 500 nonreacting cows, the temperatures of which were taken following injection for four periods of twenty-four hours each. Although according to the averages of the four periods 58.6 per cent of the cows lost steadily, the loss was slight and may well have been due to other causes. Trials with 48 reacting cows showed, from 85.4 per cent, an average loss of 2½ pounds of milk daily, as compared with healthy cows. J. F. Winchester presented a historical account of the campaign since 1886 against tuberculosis in Massachusetts.

W. J. Taylor presented the results of a study of the agglutination test in glanders. At first the preparation of the test fluid gave much difficulty, but it was soon found that the agglutinating power may be preserved for a long time. The serum will keep from three weeks to three months if the blood clot is removed. Agglutination takes place at a much higher dilution than precipitation, and the method should properly be called a precipitation test, as it is not absolutely reliable unless precipitation takes place. The presence of mallein increases the amount of precipitin in the blood.

The general features of tumors were discussed by A. T. Kinsley and classified as to variations in structure, tissue, elements, size, form, and degeneration processes.

M. H. Reynolds read a paper on stable practices as affecting milk, mentioning a large number of outbreaks of typhoid fever, scarlet fever, diphtheria, and infantile diseases due to the milk supply. An outline was given of the results obtained at the experiment stations in the study of milk pollution from improper dairy practices. The municipal regulation of milk should include the establishment of standards of fat content, the exclusion of foreign material from milk, and the pasteurization of contaminated milk. It was urged that certified milk should not contain more than 10,000 bacteria per cubic centimeter, and that the dairyman's license should depend, more than is at present the case, on laboratory tests.

Municipal milk regulation in the South was discussed by C. A. Cary. Milk inspection is largely done there by graduates of agricultural colleges rather than veterinarians. It was urged that milk inspectors should be more familiar with practical dairying, as without this knowledge laboratory tests of inspectors are of little value. Tuberculosis is not greatly prevalent in the South, but many kinds of abnormal milk are observed. Injections of boric acid in the udder greatly reduce the number of leucocytes and streptococci in milk. In some cases it was found possible to obtain milk strictly free from bacteria and leucocytes.

G. A. Johnson discussed the relation of ventilation and disease. Strangles, tuberculosis, and various other diseases spread most rapidly in badly ventilated stables. Poor air predisposes animals to disease and the endurance of horses is lowered in close confinement. Artificial heat in stables was not considered necessary.

A. D. Melvin presented suggestions for work in the eradication of tuberculosis, which he declared to be steadily increasing in extent. If the loss from tuberculosis were made to fall on the owner of the diseased stock the disease would be more promptly eradicated. All cattle shipped for slaughter should be tagged to show their origin. Much worthless tuberculin has been used, but this product is now inspected by the Bureau of Animal Industry and when properly made is reliable.

Tuberculosis in swine, according to J. R. Mohler, is rapidly increasing and causes a greater loss than hog cholera. About 1.5 per cent of hogs shipped to slaughterhouses are affected with the disease and in Europe the percentage is often higher. In hogs the disease is generally acquired by ingestion, especially of raw milk and dairy by-products and the feces of tuberculous cattle. Hogs which do not follow cattle in the field and do not receive dairy by-products are only slightly affected. The disease is on the decline in Wisconsin on account of the general pasteurization of dairy by-products in the State. In experiments, feeding hogs tuberculous milk for three days produced a general infection, and 100 per cent of the hogs became infected after eating such milk for thirty days. Hogs are susceptible to human tuberculosis and may be infected from the offal about slaughterhouses. The cervical glands are most frequently affected, the disease resembling infantile tuberculosis rather than the bovine form. The desirability of cooperation betwen the Bureau of Animal Industry and State sanitary authorities in the eradication of the disease was pointed out.

W. L. Williams gave detailed clinical notes on twenty-two cases of roaring treated by surgical operation. Two of these were ruined by the operation, thirteen entirely recovered, and the others showed great improvement. The operation originally consisted in the removal of the vocal cords and the mucous membrane of the ventricle of the larynx, but better success has attended the less severe operation of the removal of merely the mucous membrane.

The officers chosen for the ensuing year were as follows: President, W. H. Dalrymple; secretary, R. P. Lyman; and treasurer, G. R. White.

Department of Agriculture of the Federated Malay States.—The laboratory and office building of the Department of Agriculture at the Rubber Experiment Plantations, Kuala Lumpur, is approaching completion. It is a two-story building 130 feet long, containing a capacious chemical laboratory and other laboratories for the director, the government mycologist, the entomologist, the superintendent and other scientific workers, as well as a library and offices. Dr. W. J. Gallagher, a graduate of the Royal University of Ireland, who has been engaged in research in natural history at Queen's College, has been appointed mycologist of the Department.

A New Demonstration Farm in Victoria.—The Minister of Agriculture, through the agency of the Lands Purchase and Management Board, has come into the possession of an estate of 540 acres at Wyuna, which will be devoted to demonstrations showing the profits to be made by working small areas under irrigation, especially in the production of forage and its utilization by cattle.

Tobacco Experiment Stations in South Africa.—Tobacco experiment stations have recently been established at Rustenburg, Barberton, and Pretoria. Selection and breeding experiments are being carried on and attention is also being given to problems of curing. At Rustenburg and Barberton curing and fermenting sheds have been erected.

School for Bee Culture.—The Association of Apiculturists of the Province of Schleswig-Holstein has located the first provincial school for bee culture in Prussia at Preetz, the city donating the site and making an appropriation of $2,380 to establish the school. The well-known apiculturist, Witt-Havetoft, was appointed director. The first course, for young men who wish to become professional apiculturists, will open March 1, 1908, and close December 1. Short courses of from 8 to 14 days for older apiculturists are also to be held during the year.

Miscellaneous.—The *Transvaal Agricultural Journal* notes the death on May 14 of Dr. Duncan Hutcheon, director of agriculture of Cape Colony. Preceding his appointment as director of agriculture Dr. Hutcheon had been chief veterinary surgeon of Cape Colony for 25 years.

Thomas Macfarlane, since 1886 chief analyst to the Inland Revenue of the Dominion of Canada, died suddenly of heart failure, at Ottawa, June 10. He was the author of a large number of reports and pamphlets dealing especially with the analysis and composition of Canadian food products.

We learn from *La Tribune Horticole* of the recent death of Étienne Griffon, director of the school of arboriculture and horticulture at Tournay.

Dr. Heinrich Hasselbring, assistant in botany in the University of Chicago, has been appointed assistant botanist at the Cuban Experiment Station.

It is proposed to celebrate the twenty-fifth anniversary of Roseworthy Agricultural College, the first of its kind in Australia, by the erection of a memorial to Ridley, the inventor of the Australian reaper.

Augustine Henry, of the Royal University of Ireland, has been appointed reader in forestry in Cambridge University.

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EXPERIMENT STATION RECORD.

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The problems of organization and administration of station affairs become more difficult year by year as the activities and relations of the stations become more extensive and complicated. This seems inevitable, but it calls attention to the need of adjustment to the new conditions.

At one time a station council headed by a chairman was deemed sufficient to settle and manage the station business, or a college president through whose office the funds could be allotted and certain general business and correspondence conducted. We soon outgrew both of these arrangements, and have come to regard the station as a unit—not merely as an aggregation of separate departments grouped together for the purpose of sharing certain common funds. There are common aims and interests which bind the different departments together, and aside from this the station as a whole has certain outside relationships and responsibilities. These things have emphasized the need for a distinct organization and for a separate administrative officer. Effective organization has been one of the most important factors in developing the American stations and in giving them individuality.

While the desirability of a director and a certain degree of organization has become generally accepted, our conception of the duties of the director's office has not always kept pace with the growth in the station's activities and the responsibilities imposed. Coupled as these duties usually are with other services and reponsibilities, it becomes almost inevitable that some things should be left undone which ought to be done in the interest of good administration.

This is said in no spirit of criticism, but rather to call attention to several points which suggest themselves from a view of the field as a whole. The changing conditions of the stations incident to their development seem to make greater attention to these matters desirable at this time, as we are still to some degree in a condition of transition. What is said, therefore, is by way of suggestion, in an attempt to point out some general principles which should apply under the enlarged field of station activity.

The very diversity of the station work, with funds for research, for more general uses in agricultural experimentation, and often from the State for more popular features such as local or cooperative trials or demonstraions, imposes unusual duties on the administrative officer. It calls for careful study of the whole agricultural situation and needs with reference to the station work.

The new special fund for research work, although small at present, has added responsibilities and called more imperatively for careful planning. It has required relatively more attention than most of the funds because of the character of work provided for and the need of adjusting it to other activities of the station. It has necessitated more system. And when we add to the more strictly station work, the supervision of various kinds of police work, a variety of farmers' institute and extension work, the securing of new buildings and equipment, and frequently the supervision of the instruction in agriculture, it often occurs that the director's time is so divided that it is difficult for him to give adequate attention to the really legitimate station business.

Already many of the arguments forcefully used a few years ago against a college president as director are beginning to apply to the heads of some of our stations as their duties and offices are organized. These men are overburdened with a multitude of interests and duties, and this must inevitably be reflected in the details of their administration. They are attempting to do too much and are scattering their energies. Sometimes they are overestimating their capacity to do well a great variety of things, and in other instances conditions are imposed upon them which they are not able to remedy.

The direction of an experiment station is a business. Apart from the general oversight of the experiments and investigations it involves the judicious expenditure of considerable amounts of money, often under special limitations, and the orderly conduct of the affairs of the institution in a variety of directions. It calls not only for broad training and sympathies but for good administrative ability.

System and regularity are important factors in any scheme of administration. The lack of this adds greatly to the labors and anxieties, and prevents matters running smoothly in the station's internal and external relations. The difficulties might often be simplified by a closer organization of the station and a systematizing of its work. In a considerable number of instances our station management is suffering from too weak and loose an organization. There is a lack of sufficient system and formality in the planning and conduct of work and in the expenditure of funds, and a degree of independence of departments in their work and their interests which seems detrimental to the greatest economy and the highest efficiency.

While the greatest measure of freedom and individual initiative are desirable to the development of strong heads of departments, there are certain matters which pertain to good administration and which are essential to the proper conduct of the station business. The lack of closer organization and familiarity with one another's work hinders the development of the proper *esprit de corps*, and often prevents the coordination of the work of the different departments.

It seems desirable that the director should have more than a general knowledge of the work of his various departments. This is necessary for him to give it proper guidance and support and to hold it within the bounds agreed upon. Without some regular means of keeping in touch with what his men are doing he loses familiarity with it and with the course which it is taking. The outlining of projects to be filed in the director's office furnishes a means of following up the various lines of work and adjusting the expenditures. It also affords opportunity for coordinating the work of different departments and arranging for necessary cooperation.

It should also be one of the functions of the director to see that the work of different departments goes on in a regular way. It sometimes happens that work is sidetracked or dropped, or new lines substituted without the director's knowledge, and it is not infrequent to find men overburdening themselves with more experimental work than they can carry out to good purpose. Experience shows that a certain degree of regulation of the work as to amount and quality is quite essential. The amount undertaken is not always fully realized until it is outlined on paper, and this is one of the arguments for the submission of a programme of work or a list of projects.

The planning of the station's campaign and its policy requires increasing thought and study. The interests of different classes of constituents and the need for various grades of work must be considered, but in this the broader and more permanent needs of agriculture should be given full consideration. These need not be subordinated to the immediate queries of the farmers, for the two can often be harmonized and worked out together. The different phases of the work should be so organized as to offer the least possible disturbance and interruption to the working force, and plans must be laid for relieving the station proper of activities which do not strictly belong to it. Some of these still make quite heavy drains on the men's time. One of the most important functions of the director is to husband the resources and energies of his staff and to preserve an atmosphere congenial to their best work. This is not compatible with irregularity from day to day, frequent interruptions, change of work, indefinite policy, etc.

With so many station men occupying a dual position, and often with still other interests, a shifting of activities from one line of duty to another is a condition to be guarded against, for it brings great loss of efficiency and of interest in the work. Much can be done to minimize the necessity for this by systematizing the teaching, the institute work, and other duties, so that these will leave a greater amount of unbroken time. In a number of cases the conditions have been materially improved, and a general principle has been laid down which recognizes the need of continuity of effort, and the desirability of a separate staff for the more important departments.

There is still opportunity for improvement in the organization of the work with reference to inspection duties and their relation to other activities. The extent to which these interrupt more legitimate features of station work is often not realized. There is frequently some doubt as to how much of the time of the specialists is being absorbed or broken into by such work, and in some cases as to whether this service is being entirely supported by special funds. Its effect upon the men engaged in it is also an important consideration. As a matter of fact there are notable cases in which inspection work has been allowed to practically prevent competent station men from doing much else. The difficulty lies in improper organization or regulation of such work.

If the stations are to continue to exercise police control to an ever increasing extent over fertilizers, feeding stuffs, human foods, insecticides, milk-testing apparatus, nursery stock, seeds, etc., the organization of this work on such a basis that it will not interfere with or interrupt the legitimate functions of the station is a matter of much importance. Improperly organized and regulated, it becomes a serious drain on the efficiency of certain departments, which is not compensated for by the revenue it brings in. These matters may well receive more attention than is sometimes given them, for the scope and amount of this service has greatly increased in recent years. It should be adjusted to the other activities of the station, and considered in the light of its effect on general efficiency rather than the revenue it brings in.

The aversion to "red tape" has sometimes prevented discrimination between it and system. A certain amount of system and regularity in the business affairs of a station is essential to successful administration. It lightens the burden of the director and simplifies rather than complicates the duties of his office. The larger the institution the greater is its need, for the affairs soon get beyond the ability of one man to carry the details in his head.

While this applies to the supervision of both the work and the business of the station as a whole, its desirability is well illustrated in the expenditure of funds. The director can not shirk responsibility for the proper management of the station funds. Their supervision is one of his important functions. His general policy and knowledge of the needs of the work should guide him in the judicious use of these funds, and his system of purchasing and accounting should be such as to keep him fully informed as to their status and use. However much latitude he may allow in the purchase of materials after general lines of work have been agreed upon, he should at least know about important purchases of apparatus or equipment before the bills come to him for approval, and have opportunity to consider the wisdom of the purchases. He should also have sufficient data to intelligently classify the expenses among his various funds.

Without the exercise of supervision there will continue to be injudicious expenditures, unnecessary duplication of expensive apparatus which might be used by different departments in common, and considerable general confusion of funds which the accountant must untangle as best he can.

Lack of attention to the condition of accounts also allows large balances to accumulate toward the end of the year which, in the haste to save, often involve somewhat doubtful purchases. Proper planning and following up of the expenses would have resulted in more adequate and useful employment of the funds during the year. The Adams fund for the past year furnishes a number of illustrations of this kind, and emphasizes the need of following up the expenditures throughout the year and making prompt provision for using the increase of the following year. In some cases the delay in making provision for spending this fund was apparently due to untoward circumstances, but in others it was evidently due to lack of attention at the proper time.

The labor item is one likely to get beyond bounds unless there is systematic control and check upon it. Labor bills accumulate rapidly and become a large item in the monthly bills during the growing season. In some cases there is too much freedom and lack of control in this expenditure. The labor is not always suited to the special needs of the station, and the student labor especially is likely to be unprofitable. While considerable labor is indispensable to certain lines of station work, more careful planning of work at the outset and supervision of the labor expended upon it would often economize the funds spent in that direction. In cases where the experiment is on a commercial scale and yields considerable revenue the expense for labor might appropriately be charged to the sales fund rather than the Federal funds.

The preparation of bulletins and reports offers an opportunity for greater supervision, which will usually come through the director's office. The publication of bulletins without sufficient scrutiny as to fact or editorial supervision as to form and style is liable to bring embarrassment upon both the station and the writer. The investigator, from his very familiarity with the subject, is not always successful in putting his matter into the most intelligible form, and the general appearance of a bulletin counts for much. Frequently also the subject-matter laps over into the field of another department. The publications are an important product of the station's work. The effectiveness and the general impression of the station on the public are measured very largely by the clearness, accuracy, and general appearance of the material sent out. Nothing is lost by friendly criticism and suggestion, and the director may well provide some regular channel which will insure the manuscript being in creditable shape for publication before it goes to the printer.

Directors can not all be made in the same mold, and conditions are not alike at all institutions. But there are certain duties of administration which should be recognized in the efficient management of all station work and business. We have outgrown the simple methods which formerly sufficed. We need more formal and better systematized plans. The stations are growing and their relations becoming more and more involved. We must meet this by more effectual organization and administration.

The resignation of Dr. Elwood Mead from charge of the irrigation and drainage investigations of this Office closes a period of nine years of important service, which has been national in its scope and influence—a period of organization and rapid development in these two lines of agricultural engineering.

Doctor Mead has accepted the position of consulting engineer with a large company which is developing lands for irrigation near Denver under the reservoir system. Temporarily he has been released by that company in order that he might accept a short appointment under the Australian government for expert services in connection with the plans which are being laid for construction work. His intimate knowledge of irrigation laws and institutions, as well as the irrigation practice in different parts of the world, has made his services much sought for.

The funds for irrigation work grew out of a feeling that this Department should be giving attention to the peculiar problems arising under irrigated agriculture. These problems are as distinctly agricultural in character as are the improvement of plants or methods for their culture and utilization. They are concerned with the use of water in irrigation, and incidentally with whatever influences may affect that use. The drainage work has developed quite naturally out of and with the irrigation work, and has at present assumed practically equal proportions. From an initial appropriation of $10,000 in 1898, the fund for these two lines of work has grown to $150,000 for the present year. The work has proved very popular and has been in great demand, frequently in connection with large questions of interstate importance.

Following the withdrawal of Doctor Mead, it has seemed best to reorganize the work, recognizing more definitely the two different phases of irrigation and of drainage. Mr. C. G. Elliott, who has been the expert in the drainage work since it started, has been placed in charge of that branch; and Prof. Samuel Fortier, of the University of California, for several years at the head of the irrigation work which the Department has been doing in California, has been placed in charge of the irrigation branch. Both lines will remain under the supervision of this Office as before.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

On the atomic weight of nitrogen, D. Berthelot (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 1, pp. 65–67*).—The author gives figures for the atomic weight of nitrogen obtained by various methods, the average of which agrees almost exactly with the atomic weight reported in 1898, viz, 14.005.

Iodometric determination of ammonia, P. Artmann and A. Skrabal (*Ztschr. Analyt. Chem., 46 (1907), pp. 5–17; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 533, II, p. 196*).—In the method proposed an excess of sodium hypobromite of known strength is added to the ammonia or ammonium salt and the undecomposed hypobromite is determined in the usual way by adding potassium iodid and dilute sulphuric acid and titrating with standard thiosulphate, using starch as an indicator.

The recovery of albuminoid ammonia from distillates contaminated with permanganate, F. E. Hale (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 1085–1087*).—"The method, which is entirely of a chemical nature, consists in reducing the permanganate by an alkaline sulphite solution, oxidizing the manganous salt to the hydrated peroxid, filtering off the manganese on a carefully washed filter paper, nesslerizing the filtrate, and reading in the usual manner."

Separation of potassium from sodium as potassium platinum chlorid, J. Morozewicz (*Bul. Acad. Sci. Cracow, 1906, pp. 796–803; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 535, II, p. 396.*)—It is stated that since sodium platinum chlorid dissociates to some extent in absolute alcohol, forming sodium chlorid, which is practically insoluble in absolute alcohol, the weight of potassium platinum chlorid obtained by washing with the strong alcohol is found to be too large. Dissociation does not occur to an appreciable extent when 80 per cent alcohol is used, and correct results can, therefore, be obtained when this strength of alcohol is employed. Accurate results can be obtained with absolute alcohol if about 4 times the theoretical amount of acid platinum chlorid is used.

The determination of phosphoric acid in fertilizers, F. Mach (*Landw. Vers. Stat., 66 (1907), No. 1–2, pp. 1–62; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 535, II, p. 395; Chem. Abs., 1 (1907), No. 13, p. 1755*).—In this article comparisons of the Wagner, Neumann, von Lorenz, and German official methods for the citric acid soluble phosphoric acid in Thomas slag, and of the von Lorenz, Schenke, and citrate methods for total phosphoric acid in Thomas slag superphosphate and ammoniated superphosphate are reported, and the literature of investigations relating to various volumetric methods of determining phosphoric acid is very fully reviewed. There was close agreement in the case of citric acid soluble phosphoric acid in Thomas slag between the results obtained by the Wagner method and the official method with separation of silica, provided evaporation was not carried too far. In case of total phosphoric acid in Thomas slag the citrate and von Lorenz methods gave closely agreeing results, which were much lower than those yielded by the Schenke modification. The latter also gave decidedly higher results than the citrate method on superphosphates. The volumetric methods, of which the literature is critically reviewed, include the lead method of Schwarz, the alum method of Fleischer, the bismuth-nitrate method of Chancel, the silver method of Perrot, the uranium method of Le Conte and others, the molybdic method, and various titration methods.

The determination of the organic nitrogen in sewage by the Kjeldahl process. II, Studies of direct nesslerization, L. Whipple (*Technol. Quart., 20 (1907), No. 2, pp. 162–169*).—The Kjeldahl method, as used for the determination of organic nitrogen in sewage in the Massachusetts Institute of Technology, is described and tests of possible sources of error are reported.

One of the principal difficulties encountered in the use of the method is the turbidity of the digestate. Under ordinary conditions there is not sufficient calcium present in sewage to cause trouble from turbidity, but even small amounts of magnesium will render correct reading impossible. The latter, however, can be easily removed by adding an excess of 1½ per cent sodium hydroxid. The digestate is then filtered and directly nesslerized.

The analysis of silicate and carbonate rocks, W. F. Hillebrand (*U. S. Geol. Survey Bul. 305, pp. 200, figs. 24*).—This is a revision of Bulletin 176 of the Geological Survey (E. S. R., 12, p. 1006). The methods described are in the main those which have been perfected in the laboratory of the survey, but are not restricted to such methods. "A number of alternative ones are given which are known or believed to be good, in order that those who may wish to use this treatise as a practical guide shall have some choice of selection in case the expensive apparatus or complicated arrangements sometimes preferred are not available."

Precipitation and alkalimetric determination of silicon fluorid in the analysis of silicates, A. Hileman (*Ztschr. Anorgan. Chem., 51 (1906), pp. 158–170; abs. in Bul. Soc. Chim. France, 4. ser., 2 (1907), No. 11, p. 681*).—From comparative tests of various methods which have been proposed for this purpose, the author concludes that the Penfield and Bullnheimer methods give identical results and are more reliable than the other methods tested.

Determination of calcium carbonate in marl, M. J. van't Kruijs (*Chem. Weekbl., 4 (1907), pp. 29–32; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 533, II, pp. 197, 198*).—In the method recommended the sample of marl is reduced to a fine state of division by repeated grinding with successive small quantities of water, the fine powder in suspension being transferred to a Scheibler apparatus, and the carbon dioxid set free by addition of 30 per cent acetic acid. The reaction is considered complete in 1¼ to 1½ hours.

On the flocculation of clay emulsions, H. Hermann (*Ztschr. Anorgan. Chem., 53 (1907), No. 4, pp. 413–418, figs. 5*).—Observations on the effect of stirring and of the addition of different amounts of potassium nitrate are recorded.

A formaldehyde color test for proteids, I, S. F. Acree (*Amer. Chem. Jour., 37 (1907), No. 6, pp. 604–619*).—A preliminary account of a study of the importance of formaldehyde as a reagent for the detection of protein.

The author was led to undertake the work by the fact that when a small amount of casein or lactalbumin is mixed with a dilute formaldehyde solution and a small amount of concentrated sulphuric acid is added a violet zone is formed between the sulphuric acid and the solution. All of the proteids which the author has yet studied give the violet color when tested by this method, whereas, "in general, such substances as simple organic acids, sugars, alcohols, esters, amids, phenols, urazoles, semicarbazids, amino acids, polypeptids, and cyclic nitrogen compounds do not give the slightest color. In a few cases some violet color was developed, but in the check experiments without the formic aldehyde the same color exactly was shown; this was never the case with the proteids tested, and this fact enables us to distinguish the proteids from the nonproteids, so far as tested. In other words, the formic aldehyde reaction, as fas as tested, is much better than the biuret reaction, for it enables us to differentiate complex proteids from such compounds as polypeptids, uric acid derivatives and pyrimidins."

The author intends to continue his investigation, but "it can be stated now that a concentrated solution of formic aldehyde must not be used, and that one of the concentration 1 : 5000 is very satisfactory." Other aldehydes, ketones, etc., will be tested.

Rapid method for determining glucose with Fehling's solution, G. Lafon (*Compt. Rend. Soc Biol. [Paris], 62 (1907), No. 18, pp. 948–950*).—A modification of Bernard's method is described, which, according to the author, fits it for general use.

The value of different color reactions for identifying pentoses, F. Sachs (*Biochem. Ztschr., 1 (1906), No. 5–6, pp. 383–398*).—From a comparison of methods for clinical purposes the author concludes that though it has limitations the Neumann reaction is very satisfactory for diagnosing pentoses and preferable to the original orcin method or this method as modified by Bial.

Practical methods of detecting boric acid, J. Prescher (*Die praktischen Methoden der Bestimmung und des Nachweises der Borsäure. Lübeck: Charles Coleman, pp. 56, figs. 6*).—A summary and discussion of the detection of boric acid in the examination of feeding stuffs under the provisions of the German meat inspection law of June, 1900.

Examination and valuation of raspberry jam, E. Baier and P. Neumann (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 11, pp. 675–680*).—Raspberry jam contains on an average more material insoluble in water, than similar goods from other fruits, the values in jams examined ranging from 4.2 to 9 per cent. In the author's opinion, the ratio between water soluble material and sugar-free extract insoluble in water and between the alkalinity and the material insoluble in water are factors of decided value in judging of purity. A microscopical examination is also important.

Examination and valuation of ground black pepper, F. Härtel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 11, pp. 665–675*).—The analytical data reported are discussed on the basis of judging the quality of pepper. When the crude fiber content is about 17 per cent the author believes that determinations of the glycogen value are desirable, as this factor is not so affected by drying. In general, the determination of both these values is to be recommended. The author regards 6.5 per cent as the maximum value for ash content. Appended to the article are a number of formulas for mixing pepper.

A new method for the determination of nicotine in tobacco, W. W. Garner (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102, pp. 61–69*).—Six gm. of the pulverized air-dried material is treated with 3 to 5 cc. of a 5 per cent solution of sodium hydroxid and extracted for about 4 hours with 100 cc. of gasoline. Traces of ammonia are removed from 75 cc. of the filtrate by allowing it to stand for 1 hour, after which 10 cc. of fifth-normal sulphuric acid in 50 cc. of water is added and the mixture shaken in a separatory funnel. The aqueous layer is then drawn off and the gasoline washed twice with water. The excess of sulphuric acid is titrated with tenth-normal alkali, using cochineal as an indicator. One cc. of fifth-normal sulphuric acid is equivalent to 0.0324 gm. nicotine.

Apparatus for the supply of carbon dioxid in the determination of nitrogen in organic compounds by the absolute method, G. Young and B. Caud-

WELL (*Jour. Soc. Chem. Indus.*, *26* (*1907*), *No. 5*, *pp. 184, 185, fig. 1*).—A simplified form of Thiele's gas generating apparatus is described.

Apparatus for determining urea and total nitrogen, G. LAFON (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 17*, *pp. 899, 900, fig. 1*).—The instrument described is designed for use in determining urea and total nitrogen by the use of hypobromite. According to the author's investigations, accurate results can be obtained with it.

METEOROLOGY—WATER.

The progress of science as illustrated by the development of meteorology, C. ABBE (*Phil. Soc. Wash. Bul.*, *Vol. 15*, *pp. 27–56*).—The author traces the development of meteorology, particularly as indicated by the formation of national meteorological organizations and societies for research in meteorology, progress in the knowledge of elementary meteorology, and the constitution and properties of the atmosphere, and especially in recent contributions to the mechanics of the atmosphere by Bigelow and others.

New problems of the weather, W. L. MOORE, W. J. HUMPHREYS, and O. L. FASSIG (*U. S. Dept. Agr. Yearbook 1906*, *pp. 121–124*, *pls. 3*).—This article briefly describes the equipment at the Mount Weather Observatory of the Weather Bureau of this Department for the study of the upper atmosphere by means of kites or captive balloons, of the relation between sun and weather by means of the effect of solar radiation on terrestrial magnetism, and in experimental physics, the latter including spectroscopic investigations in cooperation with the University of Virginia.

It is explained that this observatory has been established for the promotion of "study and research leading to an increase in our knowledge of the laws governing the atmosphere such as should eventually enable our successors, if not ourselves, to add to the accuracy of weather forecasts and to make them for a longer period in advance," for it is realized that there is little hope of material improvement of practical forecasting "until a substantial addition is made to the pure science of the problem."

Cloud-bursts, so-called, E. L. WELLS (*U. S. Dept. Agr. Yearbook 1906*, *pp. 325–328*).—The author explains the popular use of the term "cloud-bursts," but states that "modern meteorologists have come to believe that in many instances at least the damaging floods occasioned by what are called cloudbursts are not so much a result of extraordinary and unexplained meteorological phenomena as they are the result of a topography favorable to a higher percentage of run-off, and a concentration of this run-off into a comparatively narrow and swift-moving stream."

The why of the weather, H. M. WATTS (*Jour. Franklin Inst.*, *164* (*1907*), *No. 1*, *pp. 43–46*).—This is an abstract of a paper illustrated with lantern slides in which the author developed "the general theory now held by leaders in the meteorological world as to the cause of variations in weather and climatic conditions."

Monthly Weather Review (*Mo. Weather Rev.*, *35* (*1907*), *Nos. 5*, *pp. 207–254*, *figs. 4*, *charts 9*; *6*, *pp. 255–302*, *figs. 5*, *charts 6*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of May and June, 1907, recent papers bearing on meteorology, recent additions to the Weather Bureau library, bibliographical notes, etc., these numbers contain the following articles and notes:

No. 5.—Biographic note on Dr. Alexander Buchan; Resolutions Adopted at the Milan Conference for Scientific Aeronautics, trans. by A. L. Rotch; Guilbert's Rules for Weather Prediction, by O. L. Fassig; Principles of Forecasting the Weather, by G. Guilbert; Observations of Halos at Columbia, Mo., by

G. Reeder; Observations of Halos and Coronas in England, by M. E. T. Gheury; The Relation of the Movements of the High Clouds to Cyclones in the West Indies (illus.), by J. T. Quin; Hailstorm at Corpus Christi, Texas, by J. L. Cline; Special Temperature Observations Made on Low Ground in the Vicinity of Vicksburg, Miss. (illus.), by W. S. Belden; The Philippine Weather Bureau; May Weather at Bangor, Maine; May—Past and Present, by E. D. Larned; Memorandum on the Gulf Stream and the Weather; Climate and Agriculture (outline of a course of lectures by T. L. Lyon, of Cornell University); Weather Bureau Men as Educators; The Cold Spring of 1907, by A. J. Henry; Barne's "Ice Formation with Special Reference to Anchor Ice and Frazil" (illus.), by W. W. Coblentz; Halos and Rain or Snow, by M. L. Dobler; Electric Storm in Southern California; Value of Weather Forecasts to Natural Gas Companies; and Meteorology in Australia.

No. 6.—Tornado at Wills Point, Texas, May 25, 1907 (illus.); Relations of the U. S. Weather Bureau to the Railroad Man; Legal Decisions as to Cyclones; Thunderstorms and Squalls; Climatology of Springfield, Mo., by N. R. Taylor; Hythers and the Comparison of Climates, by W. F. Tyler; An Old Indian Rule for Predicting Winter Temperatures; Hygiene and Climatology; Pale Green Sky Tints; Aerial Exploration Above the Ocean; Foehn in New South Wales; The Heaviest Local Rainfalls in California; Educational Notes (instruction in meteorology at Harvard); Dissemination of Useful Knowledge (through American research publications); Meteorological Terms Used in the Philippines; Weather Bureau Men as Educators; Confounding Cause and Effect (in case of temperature accompanying thunderstorms); The St. Swithin's Day Fallacy, by J. H. Morrison; The "Santa Ana" of California; Standard Time; Penalty for Counterfeiting Forecasts; Equinoctial Storms, by E. B. Garriott; Special Cloud Observation (illus.); Lenticular-Cumulus Clouds in Colorado (illus.), by J. B. Willsea; and Distinguished Cooperative Observers.

Meteorological observations, J. E. OSTRANDER and T. A. BARRY (*Massachusetts Sta. Met. Buls. 223, 224, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1907. The data are briefly discussed in general notes on the weather of each month.

Meteorological report for the year ending December 31, 1905, F. SMITH (*Wyoming Sta. Rpt. 1906, pp. 57–62*).—The character of the meteorological equipment and of the observations made at the Wyoming Station is briefly explained and summaries are given of the temperature, pressure, precipitation, and wind movement during each month of 1905, and of the temperature and precipitation at Laramie for each year from 1891 to 1905. The maximum temperature recorded was 91° F., July 13, the minimum —42°, February 12, the mean 40.1°. The average barometric pressure was 23.069 in., the annual precipitation 9.76 in.

Swedish meteorological observations, 1906, H. E. HAMBERG (*Met. Iakttag. Sverige [Observ. Mét. Suéd.] K. Svenska Vetensk. Akad., 48 (1906), pp. X+157*).—This report is divided into 3 parts: (1) Daily observations at 18 stations of the second order, (2) monthly and annual summaries of all the meteorological elements furnished by 39 stations of the second order, and (3) 5-day means of temperature at the 39 stations included in part 2.

Rainfall observations (*Nedböriagttagelser i Norge, 12 (1906), pp. XX + 219, figs. 6, charts 2; abs. in Nature [London], 76 (1907), No. 1968, pp. 278, 279*).—This report summarizes observations at about 430 places during 1906, and includes means from 77 additional stations which have been discontinued. Daily observations on rainfall at 200 places and on snowfall at 50 places are recorded. Some of the yearly and monthly summaries go back as far as 1867.

Maps showing isohyets are given. These show a range of from 1,200 to 3,000 mm. on the west coast (latitude 59° to 62°) to 400 to 800 mm. yearly inland.

Science of the air with respect to ventilation, N. W. HOSKINS (*Tech. Lit., 2 (1907), No. 1, pp. 5, 6*).—The relation of the composition of the atmosphere to its sanitary condition is briefly discussed.

The atmosphere of towns, H. HENRIET (*Rev. Gén. Sci., 18 (1907), No. 5, pp. 183–190*); *abs. in Chem. Abs., 1 (1907), No. 14, p. 1886*).—The respects in which the air of cities and towns varies from that of the open country, the sources of contamination, and means of improving the air of urban districts are discussed.

The activity of air and spring water, F. HENRICH (*Ztschr. Electrochem., 13 (1907), No. 27, pp. 393–406*).—Investigations bearing on the radio-activity of air and water are reviewed.

Sanitary engineering with respect to water supply and sewage disposal, L. F. VERNON-HARCOURT (*New York, Bombay, and Calcutta: Longmans, Green & Co., 1907, pp. XXII + 419, figs. 287*).—The part of this book relating to water supply discusses ancient waterworks and available rainfall, sources of water supply, wells, lakes, and storage reservoirs, dams of various kinds and construction, intakes and conveyance and storage of supply, purification of water supplies, and distribution of water supply.

The second part, dealing with sewage disposal, discusses house drainage and disposal of refuse, sewerage, outfalls and clarification of sewage, utilization and purification of sewage on land, and chemical, electrolytic, and bacterial purification of sewage.

As regards sewage irrigation, it is pointed out that theoretically this is the proper use to be made of such waste products, but "so many difficulties surround the problem that the combined efforts of chemists and engineers have been unable in most instances to find a remunerative solution. . . . The great merit sewage irrigation possesses, as compared with discharging the sewage into a river or the sea, is that it utilizes the sewage to the utmost extent practicable, with great benefit to the land, and, under proper management, at a reasonable expense, and with efficient purification of the effluent." Previous clarification of sewage by septic tank or other forms of treatment promises to simplify the problem of sewage disposal by irrigation.

The value of pure water, G. C. WHIPPLE (*New York: John Wiley & Sons; London: Chapman & Hall, Ltd., 1907, pp. VIII + 84, dgm. 1*).—This is in the main a revision of a paper previously noted (E. S. R., 18, p. 314), which appeared originally in the series of scientific contributions, entitled "Biological Studies of the Pupils of William Thompson Sedgwick," with the addition of a few extracts from other lectures and addresses.

The author attempts from available data to establish formulas to be used in calculating the permissible depreciation due to sanitary quality, physical characteristics (color, odor, etc.), hardness, etc., of the water supply.

"The whole study is intended to illustrate a fact which in the past has been too little appreciated, namely, that an impure water supply affects not only the health and comfort of a community, but also the individual pocketbooks of the people."

State water survey of Illinois (*Engin. News, 57 (1907), No. 12, pp. 316, 317; abs. in Chem. Abs., 1 (1907), No. 12, pp. 1595, 1596*).—This article is based on the latest report of this survey, which has been in progress since 1895, the work being carried on through cooperation between the University of Illinois, the U. S. Geological Survey, and the State geological and water surveys. The report is divided into 4 parts: (1) Epidemics, (2) sewage purification, (3) water supplies, and (4) streams. A special feature is an account of a series of tests of septic tanks at Urbana.

SOILS—FERTILIZERS.

The use of soil surveys, J. A. Bonsteel (*U. S. Dept. Agr. Yearbook 1906, pp. 181–188*).—Attention is called to the vast extent and largely undeveloped state of the soil resources of the United States. The soil survey of the Bureau of Soils, in anticipation of the time "when the farm land now in use must be handled more intensively and more effectively and each acre must be made to produce to its maximum capacity the crops for which it is best fitted, . . . is examining into the total soil resources of the country and investigating the broad problems of the relationship of soil to crop."

The soil survey work began in 1899, and by June 30, 1906, a total area of 118,686 square miles, or 75,959,865 acres, in 43 States and 4 Territories, had been mapped. The surveys thus cover something less than one-tenth of the area actually in farms and about one-twenty-fifth of the entire area of the United States. "They have been so distributed as to constitute numerous studies of each important geographical and agricultural district. . . . The soil survey recognizes at present 13 great soil provinces, 58 soil series, and 461 soil types. Of these types some 130 are more or less local in character, while the remainder are of widespread occurrence within their respective provinces."

In making the surveys account is taken both of the character of the soil differences and the effects which they produce in the growing of farm crops.

"The individual report upon each soil-survey area contains an account of each soil type within the area. It gives a description of the characteristic appearance of the type and summarizes the crop uses to which it is put within the area. The methods of handling the soil are given, and a general statement is also made of the range of crop production. Such a report summarizes the actual uses of the soil within these restricted limits, and it also summarizes the farm practices in the given region. Each report also contains an account of the crops raised in other areas where the same type of soil has been encountered; and suggestions as to new crops, new methods of soil management, and new industries are made as a result of this wider knowledge secured from numerous surveys.

"From these reports on soil surveys the individual farmer may learn the relationships of the soils upon his own farm, not only to the other soils in the immediate neighborhood, but to soils of the same character in widely separated regions. He may thus observe and study understandingly the methods and results obtained under the most favorable conditions by successful farmers upon these soils."

The soil surveys also aid that large class of persons who for various reasons desire to secure new farms in more or less distant localities for the pursuit of general agriculture or for the production of special crops; large investment companies dealing in farm lands, and educational institutions engaged in the study and teaching of soil subjects.

No less important than these immediate and present uses will be the use of these surveys to supply future need for information regarding crop and soil adaptations which will result from increasing population, with greater intensity of cultivation, greater demands upon the soil, and greater precision and skill in the selection and handling of soils for special crops.

Reclamation of white-ash lands affected with alkali at Fresno, California, W. W. Mackie (*U. S. Dept. Agr., Bur. Soils Bul. 42, pp 47, figs. 2*).—This is an account of the work of the Bureau of Soils in reclaiming a tract of 20 acres of alkali land about 4½ miles southwest of Fresno by drainage and flooding. The work began in 1900 with a survey of the Fresno district, including the white-ash lands affected by the rise of alkali. The actual operation of flooding and drainage began in November, 1902, when a drainage system consisting of a main drain 2,010 ft. in length, and 9 laterals 3,650 ft. in length, was installed. The main drain emptied into a sump from which the drainage water was lifted by a pump.

"On account of the extreme height to which the ground water rises at certain seasons and of the difficulties previously experienced with hardpan and quicksand it was decided to place the tiles at an average depth of 3 ft. The water table each year rose much higher than this depth, and it was feared that the drainage system placed at a greater depth would be swamped by the rush of water from surrounding farms and would prove ineffectual. Six-inch tiles were secured for the mains, but a large number of 3-in. tiles had to be used in the laterals."

The results of the experiments extending over three seasons are summarized as follows:

"It has been found that alkali can be washed out of these white-ash soils, where no hardpan occurs close to the surface, during one irrigating season. It should then be fit to produce paying crops.

"The alkali at Fresno in the white-ash soils consists mainly of black alkali. To remove this alkali rapidly and effectively, it has been found necessary to hold water continually for several months over the soil at a depth of about 1 ft. When this is done, black alkali need not be feared.

"The amount of tiling necessary to drain these alkali lands for reclamation has been determined to be far less than formerly thought necessary. Natural stream channels and the great porosity of these soils made it possible to place drains several hundred feet apart, thus materially reducing the cost of reclamation.

"Efficient drainage systems, together with pumps of small capacity, have been found to remove easily and permanently a sufficient quantity of ground water to keep the water table below the danger limit throughout the irrigating season. These pumps may be readily driven by power furnished by water wheels in the canals. Cheap electricity also soon promises to be available for this purpose where water power is not to be had.

"When installing drainage systems, a competent engineer should be employed in order that the drains may be correctly laid on a proper and uniform grade. A contour survey of the surface of the land, together with one of the hardpan, is necessary to avoid the heavy cost of digging through hardpan and at the same time to secure the best drainage.

"In placing the tiles in the trench great care should be taken to crowd them closely together to exclude silt and sand. Silting is a serious problem in many alkali soils, but may be overcome readily by placing cables in the drains and drawing brushes through them.

"The time necessary to drive alkali out of the freer soils by continuous deep flooding may be as short as 6 weeks. Heavier soils require more time, but usually not more water.

"The practical trench test, to determine when the alkali has been sufficiently removed and when flooding should cease, should be used. A grain crop should follow during the next winter season. Any spots showing alkali can then be readily detected and treated in the following spring and summer.

"With the experience gained by the Bureau of Soils as a guide no insurmountable difficulty in freeing land from alkali should be encountered by farmers. The success attained in draining individual farms at the Toft-Hansen tract and other places clearly demonstrates that such drainage is a permanent and financial success. That such individual work will in time solve the problem of alkali reclamation seems highly probable."

Reclamation of alkali land in Salt Lake Valley, Utah, C. W. DORSEY (*U. S. Dept. Agr., Bur. Soils Bul. 43, pp. 28, pl. 1, figs. 2*).—This bulletin describes the Salt Lake Valley, its soil and alkali conditions, and the methods and results of reclamation work carried on by the Bureau of Soils and the Utah Experiment Station on a 40-acre tract in the valley since 1902. Previous work has been reported (E. S. R., 15, p. 859).

The contents of the bulletin are summarized as follows: "It has been shown that extensive tracts of land in Salt Lake Valley west of the Jordan River are not productive on account of alkali. On account of the nearness to excellent markets it is highly desirable that the farmer should know how to remove the alkali. Reclaiming alkali land to a limited extent has been practiced since the first settlement in the valley in 1847, but no extensive work has been undertaken by private enterprise. An experiment on 40 acres of worthless alkali land 4 miles west of Salt Lake City, conducted by the Bureau of Soils and the Utah Experiment Station, showed that such work is practicable, since the reclaimed land now supports a good stand of alfalfa. These results were accomplished by heavily flooding the land after a drainage system had been installed. It was found that surface flooding for one year leached away large quantities of alkali from heavy soils; in fact the quantity of alkali was so reduced that shallow-rooted crops could be grown the following year. The cost of reclaiming this tract of land is not large in comparison to the enhanced value of the land. . . . Much of the now idle land in Salt Lake Valley can be made to yield handsome returns by a limited outlay of time and money."

Excluding the cost of leveling, but including that of drainage, it is estimated that the alkali lands of this valley may be reclaimed at a cost of from $20 to $35 per acre.

Reclamation of alkali soils at Billings, Montana, C. W. DORSEY (*U. S. Dept. Agr., Bur. Soils Bul. 44, pp. 21, pl. 1, figs. 2*).—The soil and alkali conditions in the Yellowstone Valley and the methods and results of reclamation work commenced by the Bureau of Soils in 1898 (E. S. R., 10, p. 1026) are described.

It is stated that the soils of the Yellowstone Valley, in which Billings is situated, are largely heavy loams and clays which naturally contain large quantities of soluble salts, especially in the lower depths, derived from the shales and sandstones from which the soils of the valley have been formed. In the early development of the valley the areas visibly affected by alkali accumulations were small and attracted little attention, but with the extension of irrigation, involving as it often did the application of excessive amounts of irrigation water on heavy soils having very poor natural drainage, the damaged area has rapidly increased in size.

"An examination in 1898 by the Bureau of Soils showed that the deep subsoils were rich in salts, that shallow drains would be ineffectual, and that washing the surface only removed the accumulated alkali from a shallow depth of soil. . . . The experiment in reclaiming a worthless tract of alkali land by deep underdrainage and surafce flooding, conducted by the Bureau of Soils, proved successful, and after one year's treatment a good crop of oats was harvested. . . . At the present time the outlook in the valley is most promising, owing to the widespread interest manifested in the formation of drainage districts in the areas most severely damaged by excess of seepage waters and alkali."

The cost of drainage in these experiments was $35 per acre, but it is believed that with locally made tile and by excavating the trenches in the spring when the soil is more moist the cost need not exceed $15 to $20 per acre.

Texture of Massachusetts soils, G. E. STONE and N. F. MONAHAN (*Massachusetts Sta. Rpt. 1906, pp. 190–198, pl. 1*).—Mechanical analyses of typical soils from different parts of the State are reported and briefly discussed. The soils examined are classed as market-garden soils, cucumber soils, asparagus soils, tobacco and onion soils, rose soils, drumlin soils, and miscellaneous, including especially various samples from different parts of the experiment station farm.

Does the northern forest dry the soil? D. KRAVCHINSKII (*Lyesoprom. Vyestnik, 1906, No. 10; abs. in Zhur. Opuitn. Agron. (Russ. Jour. Expt. Landw.), 8 (1907), No. 1, pp. 72, 73*).—The author gives a table of determinations of moisture on meadow, pine woods, and fir woods down to a depth of 1 meter. The samples were taken once on August 9. Notwithstanding the fact that the meadow was found to be more moist than the pine woods by 2.5 per cent and than the fir woods by 5.85 per cent, the author arrives at the conclusion that it is not possible to say that the northern forest dries the soil, since it must be remembered that the crowns of the pines retain about 23 per cent and those of the firs up to 41 per cent of the amount of the precipitated rainfall.—P. FIREMAN.

Root action and bacteria, E. J. RUSSELL (*Nature* [*London*], *76* (*1907*), *No. 1964, p. 173*).—Experiments by the author and others are cited to show that heating the soil promotes the growth of many plants in a soil not deficient in calcium carbonate and increases the assimilation of organic and inorganic constituents. It is suggested that the injurious effect observed by Pickering (E. S. R., 19, p. 127) may be due to a deficiency of calcium carbonate in the heated soil.

Progress of the inoculation experiments, D. FINLAYSON (*Country Life* [*London*], *21* (*1907*), *No. 544, pp. 797–799, figs. 8*).—The beneficial effects in the early stages of growth of inoculation with Professor Bottomley's cultures for horse beans, alfalfa, sweet peas, and garden peas are noted and the influences of inoculation in increasing the nitrogen content of legumes, as well as the possibility of cross inoculations, are discussed.

On the question of nitrogen fixation in cultivated soils, F. LÖHNIS (*Mitt. Landw. Inst. Breslau, 4* (*1907*), *No. 1–2, pp. 39–46*).—This is a controversial article referring to previous articles by Pfeiffer (E. S. R., 16, p. 858; 18, p. 617).

The present status of the nitrogen problem, A. F. WOODS (*U. S. Dept. Agr. Yearbook 1906, pp. 125–136*).—This article reviews recent progress in investigations relating to the directly available nitrogen content of soils, the decay of organic matter, fixation of atmospheric nitrogen by soil bacteria, root-nodule bacteria, and the fixation of nitrogen from the atmosphere by electrical methods.

Special attention is given to methods of inoculation, and the conclusion is drawn that "pure-culture inoculation must eventually mainly replace the soil-transfer methods for all kinds of soil inoculation, but this has not yet been put on a practical basis for any except the nodule bacteria. The improved cultural and selection methods introduced by this Department in the practical handling of these forms have brought within reach of every farmer who may need them pure cultures of the most virile, vigorous, and best types of root-nodule bacteria for each particular leguminous crop. It requires care and skill, however, to make and keep these cultures in good condition. For lack of this, many who have tried to make these cultures have failed."

On the liming of beech moorland, P. E. MÜLLER and F. WEIS (*Naturw. Ztschr. Land. u. Forstw., 5* (*1907*), *Nos. 1, pp. 52–65; 3, pp. 154–170, figs. 2; 4, pp. 185–202, figs. 4; 5, pp. 225–249; Forstl. Forsögsv., 1* (*1906*), *No. 3; abs. in Skogsvårdsför. Tidskr., 5* (*1907*), *No. 1, pp. 27, 28*).—A series of experiments and observations is reported, which shows that liming of moor soils favors nitrification and the formation of nitrogen compounds which promote the growth of higher plants.

Losses in making and storing farmyard manure, T. B. Wood (*Jour. Agr. Sci., 2 (1907), No. 2, pp. 207–215; abs. in Chem. Abs., 1 (1907), No. 14, p. 1890*).—The character of these investigations and the results obtained are briefly stated as follows:

"Two pairs of young heifers were fed on a weighed and analyzed diet, and their dung was sampled and analyzed both in the fresh and in the rotted states.

"It was found that the fresh dung contained about three-fourths of the nitrogen, two-thirds of the phosphoric acid, and seven-eighths of the potash consumed by the animals in food and litter.

"The dung made by the cake-fed animals was found to be more readily fermentable, and consequently more liable to loss during storage, than that made by the animals fed on roots and hay only.

"The loss was found to fall chiefly on the ammoniacal nitrogen, in which the cake-made dung is comparatively very rich.

"Taking as a base line the amounts of nitrogen and phosphoric acid in the dung of the animals fed on roots and hay only, it was found that the fresh dung of the cake-fed animals contained 82 per cent of the nitrogen and 70 per cent of the phosphoric acid of the cake they had consumed.

"So great, however, was the loss of ammoniacal nitrogen from the cake-made dung that after 6 months' storage under cover in the solid undisturbed state in which it was left in the boxes by the animals only 37 per cent of the nitrogen of the cake still remained in the rotted dung.

"Dung is not usually kept so long as this, nor through such a hot time of the year, so that the average loss will probably be less than that found in the experiment, and one-half the nitrogen of purchased foods may very well be the average amount recovered in the dung.

"The experiment shows, however, that, without any very flagrant mismanagement, the proportion recovered may fall considerably below one-half, especially if the dung suffers further loss while lying on the surface of the land in dry weather."

Experiments in sampling liquid manure and observations as to conditions bearing upon the storage of liquid manure in cisterns, F. Hansen and R. K. Christensen (*Tidsskr. Landbr. Planteavl, 13 (1906), pp. 235–250*).—The results of analyses made by the authors show that liquid manure in cisterns should be sampled in different places below the surface, since the surface layer is likely to be too low in nitrogen through evaporation of ammonia. Satisfactory results are also obtained by analysis of a single sample taken half-way down the cistern, the error thus introduced being as a rule below 0.02 per cent nitrogen. Direct experiments in which liquid manure and solutions of ammonium carbonate or sulphate were kept in liquid tanks for 4 months showed losses through evaporation of ammonia of about 30 per cent of nitrogen in the case of the former two liquids and of 0.5 per cent in the case of ammonium sulphate.—F. W. WOLL.

Green manuring, A. Trunz (*Die Gründüngung, ihre technische Durchführung und wirtschaftliche Bedeutung nebst Beschreibung von Gründüngungswirtschaften. Berlin: Paul Parey, 1906, pp. IV+60; rev. in Ztschr. Landw. Versuchsw. Österr., 9 (1906), No. 12, p. 1069*).—This booklet discusses the nature and value of green manuring; various old and new systems of green manuring; the character, culture, and handling of various green manuring plants; and the value and adaptability of green manuring under various conditions and in connection with different systems of agriculture.

The suitability of the vegetation method for the determination of the fertilizer requirements of soils, V. Sazanov (*Zhur. Opuitn. Agron. (Russ. Jour.*

Expt. Landw.), 8 (1907), No. 2, pp. 129–146).—Pot and field experiments on this subject were conducted at the Ivanov Experiment Station during the years 1904, 1905, and 1906 on clayey chernozem soils with summer wheat and beets.

In the pots all soils showed a great need of nitrogen fertilizer, while in the field there was apparently little or no need of it. Two of the soils required no fertilizer whatever in the field, contrary to the indications of the pot experiments. The other two soils were very responsive in the field to phosphoric acid, which raised the yield very materially, while in the pots they were but slightly affected by this fertilizer. As to the potash, the results were similarly discordant. The author concludes that pot experiments are not suited to indicate the requirements of soils for fertilizers.

Experiments are reported in which oats were raised on the soil as soon as it was removed from the field to the pot and on the same soil which had been allowed to remain in the pot a year before the culture of oats was undertaken. In the first case nitrogen fertilizer was very beneficial, but in the second without effect. Analysis showed that by remaining a year in the pot the soil became greatly enriched in nitrogen, the original nitrogen content of 17.8 mg. rising to 43.5 mg. per kilogram of dry soil. There is no doubt that the result in pot experiments must depend to a great extent on the time of the year when the soil samples are taken from the field.—P. FIREMAN.

Report of cooperative fertilizer trials, 1906, P. BOLIN (*K. Landtbr. Akad. Handl. och Tidskr.*, *46* (*1907*), *Bihang*, *pp. 103*).—The cooperative fertilizer trials conducted under the auspices of the Royal Swedish Agricultural Academy were continued during the year, 198 different series with about 5,870 plats having been arranged for on 120 farms located in different parts of the country. Ninety-eight series of trials were conducted with spring grains, 75 with roots, 24 with hay crops, and 1 with winter grains. The results of the trials conducted during the year are given in detail in the report, with summaries for the years 1904–1906.

The following systems of fertilization produced the best financial results with the different crops on the average for the 3-year period: For oats, both on clayey and sandy soils 200 kg. of nitrate of soda and 300 kg. superphosphate per hectare; on peaty soils, 300 kg. of superphosphate and 100 kg. potash salt; for mangels, 100 kg. nitrate (top-dressing), 400 kg. superphosphate, and 250 to 300 kg. potash salt; for potatoes, 200 kg. nitrate, 300 kg. superphosphate, and 200 kg. potash salt. For hay crops the best system of fertilization varied according to whether grasses or clover made up the greater proportion of the hay; nitrate of soda produced, as a general rule, the best results for the grasses, and phosphate for hay composed largely of legumes. For mixed clover and timothy hay a complete fertilizer consisting of 200 kg. each of nitrate and potash salt and 300 kg. of superphosphate produced the best financial returns. The results obtained in the experiments show that the effect of a certain system of fertilization during the years following that of the application is often in a different direction from that indicated by the results of the first year. A decided after effect was noted, especially in the case of clover from potash-phosphate fertilization.

A separate series of fertilizer trials with different nitrogenous fertilizers—calcium cyanamid, lime niter, ammonium sulphate, and sodium nitrate—was conducted during the year, viz, 2 trials with oats on clayey soil, 1 with potatoes on sandy soil, 1 with fodder beets on clayey soil, 1 with mangels on sandy soil, and 3 with hay crops on clayey and sandy soils. The results of previous experiments with these fertilizing materials were in general corroborated in this year's work, showing that the two kinds of nitrate possess corresponding fertilizer values, and that the same holds true with calcium cyanamid and sulphate of ammonia when applied in quantities containing similar amounts of nitrogen.

Four series of experiments in subsoiling were conducted on clayey or humus soils, with vetches and oats, oats, and oats and barley. An increase in the yields of grain was obtained at harvest time from the subsoiled plats over those from the plats plowed in the ordinary way, ranging in the different series from 120 to 310 kg. per hectare, and from a loss of 10 kg. to a gain of 710 kg. in straw. There was an increase in the value of the crops harvested even in the first year, ranging from about 16 to 29 kroner per hectare ($1.75 to $5.36 per acre).—F. W. Woll.

Fertilizer experiments with precipitated calcium phosphate, III, H. G. Söderbaum (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 1, pp. 39–46*).—Precipitated calcium phosphate, prepared electrolytically according to the method of W. Palmaer, showed a fertilizing value similar to that of superphosphate in experiments conducted by the author during 1901–1905. It also resembles superphosphate in that liming has been found not to decrease its fertilizing effect, as is the case with tricalcium phosphate. The precipitated calcium phosphate contains 36 to 38 per cent of phosphoric acid, 95 per cent of which is citrate-soluble. The method of manufacture is described in the paper, with a brief account of pot experiments in which this fertilizer was compared with Thomas slag and superphosphate for oats.—F. W. Woll.

Can the availability of bone-meal phosphoric acid be increased by application of ammonium sulphate? O. Böttcher (*Landw. Vers. Stat., 65 (1907), No. 4–5, pp. 407–411; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 534, II, p. 295*).—In pot experiments ammonium sulphate considerably increased the availability of bone meal for oats growing in a humus sandy loam. This is attributed to the physiological acidity of the salt, as explained by Prianischnikov (E. S. R., 18, p. 539), for raw phosphate. Sodium nitrate had no such effect. It is questioned whether the small amount of ammonium sulphate ordinarily used in field experiments would give the results observed in the pot experiments.

Fermented bone meal was no more available than steamed bone meal.

Investigations on the action of heavy applications of ammonium sulphate in presence of organic substances and calcium carbonate in the soil, A. Stutzer (*Jour. Landw., 55 (1907), No. 1, pp. 81–91*).—Pot experiments with buckwheat followed by mustard to determine whether the injurious effect of adding organic matter (2 per cent of peat, 1 per cent of starch, and 1 per cent of chopped straw) can be prevented by adding sufficient ammonium sulphate to relieve the nitrogen hunger of the micro-organisms of the soil are reported, with incidental observations on the effect of calcium carbonate (1 per cent) under these conditions. In general the growth was poorer and the stands were less healthy with ammonium sulphate than with sodium nitrate. The addition of calcium carbonate increased the injurious effect of ammonium sulphate, both in soils which had received no addition of organic matter and those to which peat had been added. The addition of starch and chopped straw also depressed the yield. In case of the latter the injury was reduced by the addition of calcium carbonate. The addition of lime had a beneficial effect upon the following crop of mustard.

Comparative fertilizer trials with new nitrogenous fertilizers, S. Rhodin (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 1, pp. 3–21*).—The experiments here described were conducted at the experiment station at the Royal Swedish Agricultural Academy during the years 1903–1906.

The results of the trials are summarized by the author as follows: Calcium cyanamid applied directly before sowing time and harrowed in carefully and deeply did not increase the germination nor act injuriously on the young plantlets. Neither this fertilizer nor lime niter can be applied as a top-dressing to advantage, at least not for grass and potatoes. When so applied they have a strong burning effect, especially in dry, hot weather. The fertilizer value of cyanamid and ammonium sulphate for Swedish turnips, mangels, potatoes, and oats grown on clay land is fully equal to that of the sodium or calcium nitrates. The latter fertilizers are of similar value for oats. Late applications of cyanamid and ammonium sulphate greatly reduce their fertilizer value. The after-effect of the nitrogen remaining in the ground on the 2 following crops is most marked in the case of cyanamid. One kilo of nitrogen in sodium or calcium nitrate has nearly twice the value of a kilo of nitrogen in ammonium sulphate or cyanamid as fertilizers for sugar beets or fodder beets. Calcium nitrate has an excellent fertilizing effect, in most experiments even exceeding that of sodium nitrate.— F. W. WOLL.

New nitrogenous fertilizers, R. Guillin (*Bul. Soc. Agr. France, n. ser., 39 (1907), May 1, Sup., pp. 331–339*).—The manufacture and use of lime nitrogen and lime niter are briefly discussed and a number of practical experiments on different crops in France are reported.

Synthetic calcium nitrate, N. Passerini (*Rivista, 4. ser., 13 (1907), No. 10, pp. 226–229*).—An analysis of a commercial sample of lime niter is reported, showing about 13 per cent of total nitrogen and 25 per cent of calcium oxid. A very small proportion of the nitrogen was in nitrous form.

The products prepared from alkaline earth carbonates, charcoal, and nitrogen, O. Kühling (*Ber. Deut. Chem. Gesell., 40 (1907), p. 310; abs. in Chem. Ztg., 31 (1907), No. 30, Repert., p. 159*).—Studies of the amounts of alkali cyanids and cyanamids formed at 900 to 1,400° C., under different conditions, are reported.

The system, lime, nitric acid, and water, F. K. Cameron and W. O. Robinson (*Jour. Phys. Chem., 11 (1907), No. 4, pp. 273–278, figs. 2*).—The studies here reported of equilibrium in such a system were undertaken in view of the prominence which has recently been given to a mixture of lime and nitric acid ("lime niter"), as produced by the Birkeland and Eyde process.

The physiological action of dicyanamids with reference to their value as fertilizers, R. Perotti (*Centbl. Bakt. [etc.], 2. Abt., 18 (1907), p. 50; abs. in Chem. Ztg., 31 (1907), No. 32, Repert., p. 174*).—Solutions containing 2.5 parts of dicyanamid per 1,000 had no injurious effect. Such effect was observed only when the amount reached 3 to 4 parts per 1,000. Different plants varied in their power of resistance.

Storage of calcium cyanamid, H. von Feilitzen (*Chem. Ztg., 31 (1907), No. 30, p. 385; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 9, p. 478*).—It is shown that calcium cyanamid prepared by the Polzenius process contains a slight excess of calcium chlorid, which renders the product very hygroscopic, causing it to cake together in hard lumps and to burst the containing sacks. A considerable loss of nitrogen as ammonia (5 per cent or more of the total nitrogen) during 4 months was also observed.

The Stassfurt salt industry, W. C. Blasdale (*Chem. Engin., 5 (1907), p. 59; abs. in Chem. Abs., 1 (1907), No. 5, p. 628*).—The character of the deposits and the methods of manufacture at the new Stassfurt mines are described.

Cotton-seed meal as a fertilizer, E. H. Jenkins and J. P. Street (*Connecticut State Sta. Bul. 156, pp. 7*).—This bulletin briefly discusses the color, price, and nitrogen, phosphoric acid, and potash content of cotton-seed meal, as well as guaranties of composition and rebates which may fairly be claimed when the actual composition does not come up to the guaranty.

The valuation of ground fish (*Abs. in Saaten, Dünger u. Futtermarkt, 1907, No. 14, pp. 403, 404*).—The food and fertilizer value of this material, as based upon its content of fat, protein, and ash, is discussed.

Utilization of refuse liquid from beet sirup, L. KLEIN (*Pure Products, 3 (1907), No. 6, pp. 268-271, fig. 1*).—The process of drying this material and using it as fuel, with subsequent utilization as a fertilizer of the ashes obtained, are briefly described.

Analyses are reported which show that the original liquid contains about 2.8 per cent of ash, 0.3 per cent of nitrogen, 1.4 per cent of potash, and 0.03 per cent of phosphoric acid. The ash obtained from the material is reported to contain potassium carbonate about 42 per cent, sodium carbonate 12 per cent, potassium chlorid 12 per cent, potassium sulphate 8 per cent, potassium sulphite 2.8 per cent, and potassium phosphate 0.60 per cent. On storage the ashes decompose more thoroughly and the sulphite passes into other forms.

Report of the chemist—division of fertilizers and fertilizing materials, C. A. GOESSMANN (*Massachusetts Sta. Rpt. 1906, pp. 65-81*).—This includes reports on official inspection of commercial fertilizers and on general work in the chemical laboratory.

The results of examinations of 533 samples representing 354 brands are summarized. Tables show the average composition of the different classes of all fertilizer analyses, and the maximum, minimum, and average composition of special crop fertilizers. A schedule of trade values of fertilizing constituents and a list of licensed manufacturers and dealers are given.

Brief notes are also given on the examination of wood ashes and lime ashes.

Analyses of fertilizers, spring season 1907, B. W. KILGORE (*Bul. N. C. Bd. Agr., 28 (1907), No. 4, pp. 45*).—The results of the spring inspection and registration of fertilizers in North Carolina are reported, with brief explanatory notes.

Fertilizer analyses, fall season, 1906, and spring season, 1907, B. W. KILGORE (*Bul. N. C. Bd. Agr., 28 (1907), No. 7, pp. 79*).—The names and guaranteed composition of fertilizers registered for 1907, and analyses and valuations of about 700 samples of commercial fertilizers and 105 samples of cottonseed meal, examined during the fall of 1906 and spring of 1907, are reported, with explanations regarding terms used in fertilizer analyses, freight rates, valuation, etc.

Analyses of commercial fertilizers, M. B. HARDIN ET AL. (*South Carolina Sta. Bul. 126, pp. 40*).—This bulletin reports results of analyses of 744 samples of commercial fertilizers inspected under the State law during the season of 1906-7. The analyses are accompanied by notes on valuation, the composition of fertilizers and of the materials from which they are made, and the regulations controlling fertilizer inspection in the State.

The legal regulation of the fertilizer trade in Austria (*Österr. Forst u. Jagd Ztg., 25 (1907), No. 5, pp. 33, 34*).—The laws and regulations controlling this industry in Austria are briefly summarized.

AGRICULTURAL BOTANY.

Injury to vegetation and animal life by smelter fumes, J. K. HAYWOOD (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 998-1009*).—The author gives a summary of results of investigations carried on to determine the injury to vegetation by sulphur dioxid fumes near Redding, Cal., and around Ducktown, Tenn., and investigations to determine the injury to vegetation and animals by smelter wastes in the vicinity of Anaconda, Mont.

The investigations at Redding have already been noted (E. S. R., 16, p. 953).

In Tennessee the vegetation around the smelter appears from actual chemical analysis to be injured over a region approximately 20 miles long by 13 miles wide. There is little doubt but that the injury extends beyond the limits mentioned, but this can not be shown by chemical analysis, since the difference in sulphur trioxid observed in specimens of injured and uninjured trees becomes so small as to be within the results of experimental error.

The investigations in Montana were conducted to determine whether or not the vegetation is injured by reason of the sulphur dioxid set free by the smelters, whether or not enough arsenic is set free to settle on the surrounding vegetation and poison the forage plants so that they are unfit for cattle, and whether or not the waste discharged into the irrigation streams renders the water unfit for irrigation purposes.

In the first investigation it was found by careful examination that the forests were injured over a region at least 22 miles long and 15 or more miles wide. The injury to lodge-pole pines did not extend this far, but red fir was severely injured. An examination was made of leaves from injured and uninjured trees, and in 92 per cent of all the analyses the leaves from injured trees contained more sulphur trioxid than the uninjured ones.

As to the amount of arsenic given off by the smelter stacks, arsenic determinations were made of 20 samples of range grass, from which it appeared that 20 lbs. of the dried forage contained from 3 to 10.9 gm. of arsenic, the amount depending on the distance the samples were collected from the smelters.

From determinations of the effect of the waste from the smelters on the irrigation water, the author concludes that by reason of the large amount of copper discharged it is unfit for irrigation purposes.

In summarizing his observations the author states that the vegetation around the smelter for at least 7 to 8 miles south and 13 to 15 miles west was severely injured. Junipers are very resistant to smelter fumes and appear able to grow close to the smelter, red firs are very susceptible and were badly damaged at 13 to 15 miles from the smelter, while lodgepole pines appeared intermediate between the other two species, but showed some injuries for at least 10 miles. Large amounts of arsenic are discharged from the smelter on the surrounding country, being present in forage crops in large enough quantities to poison cattle. The waste from the reduction plant renders the water of the Deer Lodge River unfit for irrigation purposes.

An investigation of the injurious ingredients of smelter smoke, W. C. Ebaugh (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 951–970, pl. 1, fig. 1*).—An account is given of investigations carried on by the author to determine the effect of smelter smoke on the growth of plants. The investigations were conducted in Utah, and in addition to the observations made in the vicinity of smelters, experiments were carried on in fields to determine the effect of sulphur dioxid on beets and alfalfa.

In the experiments with alfalfa and beets different numbers of treatments with sulphur dioxid were given the plants, the amounts varying from 1 part to 10,000 parts of air to 1 part in 50,000. In another series of experiments sulphur dioxid in an aqueous solution was sprayed and poured over plants with injurious effect. The author then took up the action of flue dust on these same species of plants, and found in general that the appearance of the leaves of alfalfa and sugar beets was analogous to that produced when solid particles of flue dust were allowed to fall on the plants.

The author concludes that sulphur dioxid can not be considered harmless, especially in an inclosed space or in a moist climate, and that the harmful action of the solid emanations, called flue dust, from smelters has been underestimated.

Alkali studies, VI, H. G. Knight and R. B. Moudy (*Wyoming Sta. Rpt. 1906, pp. 45–51*).—In continuation of previous alkali studies, the investigations here reported were begun to determine what effect the presence of ions of different velocity had upon the absorption of salts by seeds and incidentally to determine whether ionic velocities had any marked effect upon salt absorption.

The authors, summarizing their report, conclude that in pure water seeds lose a portion of the salt. The absorption of salts by seeds is in direct ratio to the relative mobility of the ions. The addition of a more rapid ion, whether positive or negative, in small quantities to solutions of slower ions retards absorption of the slower ion. The experiments in which a slow positive calcium ion was added to rapidly moving ions were not very satisfactory, but the results indicate that the slow-moving calcium tends slightly to increase absorption.

The influence of magnesium sulphate on the growth of seedlings, Gertrude S. Burlingham (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 1095–1112, figs. 6*).—The investigations reported are the outgrowth of a comprehensive study of the nutrition of plants, the aim being to learn the effect of different mineral nutrients on the growth of a test plant and to note the variations produced by modifying the composition of the solutions. The test plant used was the common velvet weed, and the seedlings were transferred to water cultures in beakers containing various strengths of solutions based on the molecular weight of magnesium sulphate. In addition to the velvet weed, similar experiments were conducted with pea and maize seedlings.

The author gives the following summary of conclusions:

"Magnesium sulphate in solutions of greater concentrations than *m*/8192 has a toxic action on most seedlings, the degree of toxicity varying with the type of seedling and with the conditions. An *m*/8192 solution is toxic to pea seedlings, slightly stimulating to velvet weed, while it has a marked stimulating effect on corn seedlings. Maximum stimulation in magnesium sulphate results in solutions from *m*/32768 to *m*/131072, the point again varying according to the kind of seedlings grown. When magnesium sulphate is used in proper dilutions there may be produced a total growth nearly double that in the control; or in the case of velvet weed seedlings, a growth of the primary root 15 times that in the control. Not only is the growth of the primary root increased, but the lateral roots develop sooner, are more numerous, and attain a greater growth. Furthermore, the stimulation is lot limited to the root system, but the magnesium forces a more rapid and a greater growth of the hypocotyl and plumule. In these same concentrations, calcium nitrate causes very little stimulation.

"In addition to the marked stimulation which magnesium sulphate causes when it is used in dilutions from *m*/16384 to *m*/524288, it increases the vitality of the seedlings. The seedlings grown in the magnesium sulphate outlived those in the control by two or three weeks, and in some cases by a greater period.

"From the foregoing results and conclusions, it is then evident that magnesium sulphate, in the absence of other salts, is not necessarily injurious in its effects, but on the other hand may be highly beneficial; while any inhibitory action is due to the presence of a relatively large proportion of magnesium in the solution."

The presence of organic silica in plants, T. Takeuchi (*Bul. Col. Agr. Tokyo Imp. Univ., 7 (1907), No. 3, pp. 429–431*).—The author made a study of a number of species of plants to determine whether in plants or their products silica occurs in an organic form. The leaves of various species of grasses were subjected to analysis, and it was found that silica occurred in an organic form but that its quantity varied considerably. The exact nature of the organic silica compound was not determined.

The bacterial flora of the soil and its importance for agriculture, F. Weis (*Tidsskr. Landbr. Planteavl, 12 (1905), pp. 130–179*).—A comprehensive discussion of our present knowledge of the subject.—F. W. WOLL.

Relation of plant growth to root space, S. Kumakiri (*Bul. Col. Agr. Tokyo Imp. Univ., 7 (1907), No. 3, pp. 437–439*).—On account of the observed fact that many plants yield smaller returns when grown in small pots than when grown in large ones, the author conducted a series of experiments with spinach and barley to determine the effect of the size of pots on plant production. The same kind of soil was used in each instance, the smaller pots holding 2 kg., while the larger ones were of 10 kg. capacity.

The plants were measured and weighed, and an examination of the roots in both cases revealed great differences, the roots in the small pots growing along the wall of the pots more than in the case of the larger ones. In the large pots the plants flowered and ripened earlier than in the smaller ones, and with barley the total yield in the large pots was 4.8 times that of the small ones, while with the spinach the yield in the large pots was 2.5 times that of the small pots.

The production of races of cultivated plants inured to drought. I, Anatomical-physiological investigations, V. Kolkunov (*Izv. Kiev. Politekh. Inst., 1905, p. 82; abs. in Zhur. Opuitn. Agron. (Russ. Jour. Expt. Landw.), 7 (1906), No. 6, p. 709*).—This article is a part of the extended investigation undertaken by the author with the object of producing by selection races of cultivated plants which, utilizing the soil humidity most economically, will endure drought.

After a review of the literature concerning the protection of plants against excessive evaporation the author arrives at the conclusion that all the available data are not sufficient to explain why two races of wheat very similar in anatomical structure may differ in the magnitude of their evaporation. By means of careful measurements the author succeeded in establishing the fact that varieties of wheat and other cereals with different xerophytic properties do not differ from one another by the presence of special protecting tissues or the arrangement of their tissues, but only by the magnitude of the anatomical elements of their leaves. Moreover, it was found that the change of the magnitude of the stomata always goes parallel with the changes of the other elements, and hence it is sufficient to confine oneself to the measurement of the variations in the magnitude of some one element. As such a fundamental measure, the author accepts the length of the stomata.

The author also takes up the question as to what determines the degree of the xerophytic property of a plant—the development of its root system, as many investigators believe, or the magnitude of its evaporation. On measuring the magnitude of evaporation in plants with different xerophytic properties, the author concludes that there is a complete correspondence between the xerophytic properties of a plant and its evaporation.

From these preliminary experiments it is clear that there must exist a close connection between the magnitude of evaporation and the size of the stomata. This conclusion is corroborated by a whole series of experiments and measurements made of different varieties of wheat and other gramineous plants. It was found that the larger the stomata the more humidity the plant evaporates and the lower its xerophytic capacity. Guided by these conclusions the author succeeded in obtaining by means of selection during 4 years a race of wheat with a greater xerophytic capacity.—P. FIREMAN.

FIELD CROPS.

Report of the agriculturist, W. P. Brooks, E. S. Fulton, and E. F. Gaskill (*Massachusetts Sta. Rpt. 1906, pp. 23–60*).—The experiments here reported are in continuation of earlier work (E. S. R., 18, p. 226). This year the experiments included 308 field plats, 150 closed plats, and 286 pots in vegetation experiments.

In 1906 corn was grown in the experiment comparing different sources of nitrogen. According to the results of this year the materials ranked as follows: Barnyard manure, nitrate of soda, sulphate of ammonia, and dried blood. Based on the increase of all the crops since the beginning of the trials in 1890 the relative rank on a percentage basis was nitrate of soda 100, barnyard manure 85.31, dried blood 70.06, and sulphate of ammonia 63.54.

High-grade sulphate of potash was superior to muriate for soy beans, rhubarb, raspberries, blackberries, potatoes, and mixed hay. The muriate gave the larger crop of asparagus. In connection with determining the relative value of different potash salts for field crops potatoes were grown this year and the salts, based on the average of 5 trials for each, ranked as follows: Muriate, low-grade sulphate, high-grade sulphate, nitrate, carbonate, kainit, and silicate. The use of potash as a fertilizer seemed to reduce susceptibility to early blight.

A heavy application of manure alone gave slightly larger yields of mixed hay at the first and second cuttings than a combination of a smaller amount of manure and potash. During the 16 years this experiment has been in progress the average yields of 10 crops of corn and 6 of hay have been greater on the larger amount of manure alone but not sufficiently greater to cover the extra outlay at a cost of $5 per cord for the manure.

In connection with the comparison of different phosphates mixed hay was grown. The yields varied but little, showing that the hay crop is much less dependent upon the quantity of available phosphoric acid applied than the crucifers, such as cabbages and turnips, as indicated by previous results. The results of the soil tests indicated that the hay crop requires a supply of nitrogen in a highly available form. In the test in which barnyard manure, wood ashes, and a combination of fine ground bone and potash was applied in rotation for the production of grass, the average yield of hay in 1906 was 4,002 lbs. per acre. The average for the 14 years the test has continued is 6,389 lbs.

Winter application of manure on a slope resulted in a small loss of fertilizer value as compared with spring application, but the gain in crop was not sufficient to pay for the extra cost in applying it in the spring.

The use of nitrate of soda for rowen gave a profitable increase in crop this year, but the results in the different years the test has continued show a wide variation with the amount of rainfall during the growing season.

In a comparison of 25 varieties of potatoes, Climax, Chenango White, Hammond Wonderful, and Simmon Model ranked first in productiveness, with yields in excess of 200 bu. of merchantable tubers per acre.

The Woburn field experiments, 1905 and 1906, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 67 (1906), pp. 282–310*).—These experiments have been described in earlier reports, and former results have also been previously noted (E. S. R., 18, p. 28).

In 1905, in the continuous wheat-growing experiments, the unmanured plats yielded 14.25 bu. per acre. The highest yield, 32.45 bu., was secured on the plats receiving barnyard manure each year. The largest crop obtained with commercial fertilizers was 26.57 bu. per acre. Ammonia salts alone gave no crop worth reaping, while the plat receiving 2 tons of lime per acre in 1897 yielded 10.2 bu. per acre, or as much as was secured from the use of nitrate of soda alone. The nitrate of soda plat is undergoing a gradual diminution in yield. Ammonia salts applied with mineral manures gave a higher yield than nitrate of soda, but when the heavier dressings of the salts were used the ammonia salts showed the same signs of failure as they did when applied alone and in quantities furnishing 50 lbs. of ammonia per acre.

The rape cake plat did not give as good yield as the barnyard manure plat. Ten cwt. of lime per acre gave a good increase in yield, while 5 cwt. effected no change, and applications of 1 and 2 tons per acre seemed to retard the crop.

In 1906, the rape cake plat yielded 34.5 bu. per acre, as compared with 16.2 bu. for the barnyard manure plat. Rust was most marked on the nitrate of soda plats. The unmanured plat yielded 11.5 bu. per acre, and the plat receiving nitrate of soda with minerals produced 35.2 bu., the highest yield secured. The plat receiving ammonia salts and minerals, including 10 cwt. of lime, gave a yield of 34.7 bu. per acre. Ammonia salts alone, in quantities furnishing 50 lbs. of ammonia per acre, produced only 3.5 bu. per acre, as compared with 26.1 bu. for the plat receiving 2 tons of lime in 1897. The results of this year also indicated that the influence of a dressing of 2 tons of lime per acre will last with cereals for at least 9 years.

In both years the crop grown with nitrate of soda was characterized by a large quantity of screenings and a low bushel weight. Rape cake and ammonia salts with lime gave the best weight per bushel, lime seeming generally to be beneficial in this respect.

In 1905, in the barley-growing tests, the unmanured plat yielded 19.35 bu. per acre, while barnyard manure produced 42.6 bu., and a dressing of minerals, ammonia salts, and lime 40.6 bu. Mineral manures alone gave 23.3 bu. per acre, while ammonia salts alone gave no crop, and ammonia salts with lime but no minerals 23.7 bu. per acre. Nitrate of soda with minerals gave a yield of 30 bu., while ammonia salts with minerals and lime gave 40.6 bu. With rape cake, a yield of 34 bu. was secured. Barnyard manure excelled in yield and quality, while nitrate of soda produced the poorest quality of grain.

In 1906 the crop of barley was a distinctly heavy one, the unmanured plat yielding 15 bu., the plat receiving minerals alone 18.8 bu., barnyard manure 45.6 bu., rape cake 45.8 bu., nitrate of soda and minerals 47.5 bu., and ammonia salts with minerals, including lime, 44.3 bu. per acre. Nitrate of soda alone gave a yield of 36.3 bu., and a heavy dressing of this substance with minerals 60.8 bu. of grain and 42 cwt. of straw per acre. In the case of barley, the continuous use of nitrate of soda has apparently not been detrimental. The plats receiving ammonia salts alone, or ammonia salts and minerals without lime, gave practically no crop at all, but where 5 cwt. of lime were given, 11.6 bu., where 1 ton was used, 33.9 bu., and where 2 tons were applied last in 1897 to 2 different plats, 25.4 bu. and 44.3 bu. were secured. The further use of 2 tons of lime in 1905 resulted in an additional increase of 13 bu., though no minerals had been put on. Nitrate of soda reduced the quality slightly this season. The best weights per bushel were obtained from the barnyard manure plat and the plats fertilized with ammonia salts and minerals, including lime.

In a rotation experiment, sheep were fed per acre 12 tons of swedes, 4½ cwt. of clover hay chaff, and 920 lbs. of decorticated cotton cake, or the same quantity of maize meal. The test was conducted on 4 plats, on the first of which the swedes were fed off with decorticated cotton cake, on the second with maize meal, and on the other 2 without cake or corn. The first plat produced 8 bu. more barley and 7 cwt. more straw than the second plat, which yielded practically as much grain as plat 3, but 2 cwt. more straw per acre.

In another rotation test, in which kohl-rabi were grown instead of swedes, the decorticated cotton cake plat produced 6.4 bu more than the check plats.

while the maize meal plat produced 0.2 of a bushel less. After the barley was harvested 2 tons of lime were applied per acre and the land sown to white mustard on June 14, 1906. The heaviest yield was secured on the maize meal plat, but the yields on 3 of the plats did not show very great differences.

A green manuring experiment was conducted on Lansome field in 1905 and 1906 with tares and mustard, treated with mineral manures and lime. The tares in each case gave the heaviest yield, and when plowed under added more than twice as much nitrogen as the mustard. The following season, however, the best yields of wheat were secured on the mustard plats. Results secured in 1905 with different grades of barley seed indicated that the selection of large plump grains, or the rejection of the smaller grains, is not necessarily advisable for seed purposes.

Comparative tests of native and English wheat were made in 1905 and 1906, with the result that the English wheat, Square Head Master, in each case gave the higher yield of grain and straw. Canadian Red Fife outranked the English variety in quality, but the much higher production of the English wheat made it the more remunerative. Soot used as a top-dressing for wheat was analyzed and found to contain 4.56 per cent of nitrogen. It was applied at the rates of 40 and 20 bu. per acre. The use of 20 bu gave a slightly heavier yield than the use of 1.5 cwt. of nitrate of soda, and even the use of 40 bu. gave a profitable increase.

Fertilizer experiments with potatoes indicate that on light land 1 cwt. per acre of sulphate of potash is a better dressing than 4 cwt. of kainit, the 2 supplying practically equal quantities of potash. The best total yield of tubers was secured where 3 cwt. of superphosphate, 1 cwt. of sulphate of ammonia, and 1 cwt. of sulphate of potash were used.

The results of fertilizer experiments with mangels in 1905 and 1906 show considerable gains from the use of top-dressings with nitrate of soda and salt over barnyard manure alone. The use of 2 cwt. of nitrate of soda per acre gave a smaller crop than the use of 1 cwt. The best return in each year was obtained with the mixture of 1 cwt. of nitrate of soda and 1 cwt. of salt, and the next best from using 1 cwt. of soda alone. It was also found that mangels taken up at the usual time, about October 10, gave a smaller yield than mangels allowed to remain in the ground until the first frost, which this season was on November 12. The chemical composition of the 2 lots of roots did not show very great differences.

The best fertilizer applications for alfalfa in 1905 and 1906, the fourth and fifth years of the test, were 4 cwt. each of superphosphate, bone dust, and sulphate of potash, supplemented by 2 cwt. of nitrate of soda or sulphate of ammonia. A test of Provence, South American, and Canadian alfalfa seed resulted in favor of the Canadian. Of different varieties of clover tested, English late-flowering red gave the largest first cutting, while the second cutting was very small. The highest yield was obtained from the English red, although Chilean, Canadian red, and Canadian mammoth red gave yields almost as good. Silesian clover gave much the lowest yield.

Diversified farming under the plantation system, D. A. BRODIE and C. K. MCCLELLAND (*U. S. Dept. Agr., Farmers' Bul. 299, pp. 14*).—The need of crop diversification is discussed and an experiment in diversified farming is described. Tenants on the Rosalie plantation at Moreland, La., were induced to set aside for the experiment nearly 2 acres of land, on which were planted potatoes, watermelons, sweet corn, and cabbage. Poor seed and dry weather were most unfavorable to the corn and cabbage crops. Excluding one failure the net profits per acre with potatoes varied from $10.58 to $61.49. The yields varied from about 8 to 107 bu. per acre, averaging 61¼ bu. The potatoes were dug May 21 and 22 and sold at 90 cts. per bushel. "In addition to this crop of potatoes with profits of over $30 per acre it would have been possible to have grown afterwards a good crop of Mexican June corn or cowpeas, or other crops upon this same land and to have followed these by some winter crop."

The watermelon yields varied from 0 to 600 melons per acre, or about 300 per acre for the 15 productive plats recorded. The financial results varied from a loss of $4.54 on half an acre to a gain of $85.83 per acre, with an average profit of $25.41.

The results of this first year's work lead to the conclusion that it is possible to establish a system of diversification of advantage to the tenant and the planter.

A successful dairy farm, L. G. Dodge (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102, pp. 19–23, pl. 1*).—The system of management on this farm was studied and is reported in this bulletin. The different points discussed are the rotation followed, the harvesting of the hay, feed for cows and calves, butter production, poultry production, and the results achieved. Half the land of this farm is in permanent pasture and the rest nearly all permanent meadow. A few acres of meadow are broken up each year and sown to peas and oats with grasses and clovers, or planted to corn for soiling which is to be followed by peas and oats, grasses and clovers. The object of the bulletin is to explain a method of managing permanent grass land to maintain its productivity.

Planning a cropping system, W. J. Spillman (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102, pp. 25–31, figs. 2*).—The value of a definite cropping system for farms is discussed, and the farm selected to illustrate the methods used for this purpose is described.

In studying the requirements of this particular farm, it was found that 17.03 acres of corn, 45 of hay, 40 of pasture, and 0.52 of rape, or a total of 102.55 acres, would furnish the proper amounts of forage for the stock. The farm in question contains 103 acres of arable land and 11.77 acres of woodland pasture. It is pointed out that 25 acres of pasture for cows and 5 acres of clover pasture for hogs are required. The woodland pasture is considered as sufficient for the young stock raised on the farm.

A consideration of the conditions specified led to the adoption of one 3-year rotation as follows: First year, 7 acres of corn and 18 acres of peas and oats; second year, timothy and clover; third year, timothy and clover. A second 3-year rotation was arranged as follows: First year, corn in which clover is sown in the last cultivation; second year, clover; third year, peas and oats for hay, followed by rape sown in midsummer. A 2-year rotation was also laid out for two 5-acre fields of corn followed by fall-sown rye the first year, and rye followed by soy beans the second year.

The first 3-year rotation provides for the 25 acres of cow pasture, the second for the 5 acres of clover pasture for hogs.

The application of vegetative propagation to leguminous forage plants, J. M. Westgate and G. W. Oliver (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102, pp. 33–37, pls. 3*).—This bulletin describes a method of propagating forage plants by means of cuttings, which was worked out chiefly in connection with *Medicago sativa* and *Trifolium pratense*. *Melilotus officinalis*, *M. alba*, and *Trifolium repens* have been also successfully propagated in this manner.

The method as here described applies specifically to alfalfa, and slight modifications may be necessary to apply it to other species. It is stated that at least 95 per cent of alfalfa cuttings became well-rooted in pots. Where it was necessary to transfer the plants to cold frames in midwinter the loss was as high as 10 per cent, owing to the sudden change of temperature. "No losses resulted on one occasion in the transfer of 1,800 plants to the permanent nursery rows 5 miles distant. The tops were cut back to 6 inches in height before being removed from the pots in the cold frames."

The application of the method to practical plant-breeding problems is discussed, and a list of self-sterile and self-fertile leguminous plants is given in this connection.

Some important grasses and forage plants for the gulf coast region, S. M. TRACY (*U. S. Dept. Agr., Farmers' Bul. 300, pp. 15, figs. 5*).—Brief discussions on the value and requirements of Mexican clover (*Richardsonia scabra*), beggarweed (*Desmodium tortuosum*), velvet beans (*Mucuna utilis*), guinea grass (*Panicum maximum*), and Para grass (*P. molle*) are presented.

Notes on agave and furcræa in India, J. R. DRUMMOND and D. PRAIN (*Dir. Land Rec. and Agr. Bengal, Bul. 8, 1905, pp. 195*).—Descriptions are given of the genus Furcræa and of the section euagave of the genus Agave, together with those of species naturalized in India or cultivated for their fiber. A key to the species of euagave is given, and the more important publications bearing on the subject, in addition to those mentioned in the text, are listed. The book also contains a glossary of local and commercial terms referring to the Agaveæ and certain other fiber plants, or to their products.

Alfalfa culture in Grand Isle County, L. R. JONES and H. A. EDSON (*Vermont Sta. Rpt. 1906, pp. 269-278*).—This article is a general discussion of alfalfa growing in Grand Isle County, with a tabulated summary of some of the results secured. The average total yield per acre ranged from 2½ to 6 tons. The methods of culture indorsed include thorough preparation of the soil, early seeding with grain, preferably oats, the use of 20 lbs. of seed per acre, a light annual top-dressing with commercial fertilizer, and the use of land free from weeds, especially quack grass and dodder.

On proper soil the crop had fair success and all the growers interested pronounced it profitable, particularly on certain kinds of soil. Gravelly or slaty clay loams with good natural underdrainage and gently sloping to provide surface drainage gave the best results.

The valuation of brewing barley in its relation to agriculture and brewery use and with special reference to nitrogen content, R. WAHL (*Amer. Brewers' Rev., 21 (1907), No. 6, pp. 274-278*).—This paper was presented at the International Agricultural Congress, Vienna, 1907. The author discusses European standards as not applicable to American barley, the relative high albumen content of the most valued American barleys, the barleys produced in various sections of our country, and the albumen content of barley and the enzymatic energy of malts.

A consideration of these different points leads the author to propose a system of valuation for the barleys produced in this country. He claims that they should be divided into 3 classes with reference to brewing quality, variety, and zone of culture. In the first and highest class he would place the 6-rowed barleys with an albumen content of from 10.5 to 14 per cent, medium size and weight of berry, and medium thickness of husks, and derived from the Manshury barley introduced into Wisconsin and grown principally in Iowa, Michigan, South Dakota, Wisconsin, partly in New York, Ohio, and Colorado, and also in Quebec and Ontario in Canada. In the second class he would include 6-rowed barleys relatively low in albumen content, with a percentage below 10.5, the grains being of large size and weight, the husks thick, derived from Bay brewing barley, said to be indigenous to California, and from Utah White Club, and grown principally in California, Oregon, Washington, Idaho, Utah, Colorado, and North Dakota. The third class would contain 2-rowed barleys with an albumen content below 11.5 per cent, the berry of large size and weight, thin husks, derived from Chevalier, Hanna, or other European types, and grown principally in Montana, Idaho, Colorado, and California.

The statement is made that only 6-rowed barleys of the Manshury related varieties can be considered as first class for the preparation of chill-proof beers, especially pasteurized bottle beers, and that the extract yield from fine grist under laboratory conditions from malts made from such barleys often reaches 72 to 75 per cent of the dry matter.

Owing to the great differences in American barleys the author believes that of the different factors in the valuation of European barleys only the following are adaptable to the American crop: Siftings on shaking screens of a certain size mesh, albumen content, and thickness or quantity of husk.

The influence of distance between plants on the quantity and quality of fodder beets, G. FRÖLICH (*Illus. Landw. Ztg., 27 (1907), No. 30, pp. 273, 274*).—Experiments were conducted in which fodder beets were grown at different distances. The yields secured, together with the composition of the product, were determined. The variety grown in these tests was the Friedrichswerth fodder beet, and the results were most satisfactory from rows 14 in. apart, with the plants 9 in. apart in the row.

The relation of leaf production to yield of sugar was studied, and it was found that a leaf production of 100 gm., in the case of the Friedrichswerth beet, at harvest time corresponds to a sugar production of 44 gm.

Corn-breeding work at the experiment stations, J. I. SCHULTE (*U. S. Dept. Agr. Yearbook 1906, pp. 279-294*).—A summary of the more important corn-breeding work carried on by the experiment stations in this country.

Cotton production, 1906 (*Bur. of the Census [U. S.] Bul. 76, pp. 68, maps 12*).—This bulletin is a report on the production of cotton in 1906, with comparative statistics from 1902 to 1905, and data regarding cotton growing in foreign countries. Including linters and counting round as half bales, the crop of 1906 amounted to 13,305,265 bales, as compared with 10,725,602 for 1905 and 13,697,310 for 1904.

In 1906 the Sea Island crop consisted of 57,550 bales, being the smallest produced since 1892 when 45,418 bales were secured. The cultivation of Sea Island cotton in this country, according to ginners' returns, is confined at present to selected portions of 14 counties in Florida, 24 in Georgia, and 4 in South Carolina.

The statistics presented in tabular form include data with reference to production by States and counties, the number of ginneries operated in 1906, and the production, consumption, exports and imports of the United States from 1790 to 1906, and the quantity and value of exports of cotton seed and its products from 1870 to 1906, inclusive. It is shown that about one-fourth of our production of cotton-seed oil is exported, mainly to the Netherlands, France, Germany, and Austria, and that nearly one-third of the cake and meal annually manufactured in this country is exported, principally to Denmark and Germany.

The history of the cowpea and its introduction into America, W. F. WIGHT (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102, pp. 43-59, pls. 3*).—This bulletin is a brief history of the introduction of the cowpea (*Vigna unguiculata*) into America, presented with the purpose to establish as nearly as possible the time of its introduction and to ascertain the region to which it is native. No evidence was found that *V. unguiculata* was one of the native beans of America, but it appears to have been first introduced into Jamaica at some time between 1672 and 1687 and to have reached the southern United States later than this but before 1737. Its use apparently extended gradually northward until it reached the Potomac about 1790 or 1795.

With reference to the 2 species *V. unguiculata* and *V. catjang*, the author states that "it may be concluded from the facts so far known regarding these species that both *V. unguiculata* and *V. catjang* originally came from a region including and extending from India to Persia and the southern part of the Trans-Caspian district, and that the Persians called one or both of them by the name 'lubia' and applied that name to *V. unguiculata* in northwest India after their conquest of that region. The cultivation of *V. unguiculata* extended to China at a very early date, but the distribution of at least one of the species with the name 'lubia' had extended from the region of its origin at the beginning of the Christian era to Arabia and Asia Minor and had reached some of the Mediterranean countries of Europe at about the same time, but did not become known in central Europe until the middle of the sixteenth century."

The panicle as a factor in breeding oats and in the identification of varieties, C. Fruwirth (*Fühling's Landw. Ztg., 56 (1907), No. 9, pp. 289–301*).—This article describes the various forms of oat panicles and discusses the different characters peculiar to each as observed by the author and other investigators.

The author found from studying individual panicles that the upper spikelets produced more grains than the lower ones, and that the number of abortive spikelets and blossoms is greatest in the lower portion of the panicle and decreases as the spikelets are located nearer the top.

The author also observed variations in the hairiness at the base of the kernels. In some varieties the hairs were long and numerous, in others long but few, in some short, varying from numerous to few, and in others short and very few.

The proportion by weight of the hulls was studied and it was found that a comparison can be made only when one form of kernels is considered. It is pointed out, for instance, that if the proportion of hulls is to be taken as a factor in plant selection for breeding purposes, the grains should all be taken from corresponding portions of the panicles.

It was further observed that in addition to the spreading panicle and side-oats forms, a form may appear in which all the spikelets extend in the same direction, but which is, nevertheless, readily distinguishable from the true side-oats form. The absolute weight of the hull, as well as of the naked kernels, was found to increase from the lower to the upper part of the panicle. The double grains showed the highest percentage of hull, being followed in the order mentioned by outer kernels, single grains, and those produced toward the interior portion of the head.

It is advised that in breeding pure botanical forms the character of the spreading panicle and the hairiness of the outer kernels be considered. In the determination of the average weight of the grains or the hulls of a selected plant it is thought best to use only the outer kernels taken from the same relative position in the panicle. For crossing purposes it is advised to select the outer blossoms of spikelets in the upper whorls, as these are most likely to produce grains.

Pisum maritimum, G. Becker (*Fuhling's Landw. Ztg., 56 (1907), No. 9, pp. 325–328*).—A description of this plant is given, and the results of a few pot culture tests are reported. These experiments were conducted with the view of determining the value of this plant for cultural purposes. One of the plants attained a height of 80 cm. The root nodules located on the fine branch roots are egg shaped. The plants were not free from insect attacks.

Culture tests under humid conditions of the violet variety of Solanum commersoni and Giant Blue and Richter Imperator potatoes, P. Vincey (*Jour. Soc. Nat. Hort. France, 4. ser., 8 (1907), Feb., pp. 92–97*).—The author concludes from the results secured that the violet strain of *Solanum commersoni* is particularly valuable for sewage farms on very permeable soils, which are alternately wet and dry, according to the sewage received, but which contain quantities of plant food far beyond the necessities of the plant. For general agricultural purposes this variety is valuable on account of its resistance to mildew and its yield in starch. It is believed that this violet variety of *S. commersoni* is not identical with the Giant Blue potato, as is supposed by certain investigators.

Methods of reducing the cost of producing beet sugar, C. O. TOWNSEND (*U. S. Dept. Agr. Yearbook 1906, pp. 265–278, pls. 2, fig. 1*).—In the discussion of the subject the author suggests the following as means by which the cost of beet-sugar production may be reduced: Increasing the tonnage without increasing cost of production, improving the quality of the beets without additional expense, improving the beet in size and quality or both at additional expense, but in such ratio that the gain is greater than the outlay, providing a sufficient quantity of suitable labor at the proper time so that the beets may be kept growing without interruption, modifying the beet seed so as to render thinning unnecessary, modifying the beet so that siloing for the factory will not be required, devising machinery that will do away with hand labor, improving farming methods and operations to reduce labor requirements, and improving wagon roads and railroad facilities.

New tobacco varieties, A. D. SHAMEL (*U. S. Dept. Agr. Yearbook 1906, pp. 387–404, pls. 4, figs. 4*).—This article describes 4 varieties of cigar-wrapper tobacco produced by the author in the tobacco breeding experiments of this Department, and discusses the necessity of breeding experiments, methods of breeding, testing new varieties, and the preservation of type.

The 4 varieties described are Uncle Sam Sumatra, Hazlewood Cuban, Brewer Hybrid, and Cooley Hybrid tobacco. Uncle Sam Sumatra is a selection from a crop grown under cloth shade by M. L. Floyd in Connecticut in 1903, and Hazlewood Cuban from a crop grown under cloth shade from imported Cuban seed in the Connecticut Valley the same year. Of the type of Uncle Sam Sumatra only 28 plants were found in a field of about 40 acres containing about 50,000 plants. Pure seed of 27 of these plants was planted in 1904 and the progeny of every parent plant as grown in the test rows came uniformly true to type. Tests of the progeny of individual plants were continued in 1904 and 1905, and "the results of these and other tests have proved beyond a doubt the value of this variety for growing commercially, together with the fact that the seed comes true to type year after year when saved under bag." The plants reach an average height of about 8 ft. at the time of maturity and bear an average of about 26 leaves before topping. The cured leaves average about 16 in. in width by 20 in. in length, and are especially adapted for economical cigar-wrapper cutting. The veins are small and fine and regularly arranged, and the burn is excellent.

In 1903, 5 distinct general types of tobacco were found in the crops grown from Cuban seed and 340 plants of these types were kept for seed production, this seed being saved under bag. One of these types, No. 13, was especially desirable from a practical standpoint, and 32 typical plants were found after a careful examination of about 48 acres grown under shade. The seed of these plants, free from cross-fertilization, was saved and tested the following year. The transmitting power of the parent plants of the type was very marked, and the results of these and later tests were so satisfactory that limited quantities of seed of the type were distributed under the varietal name of Hazlewood Cuban for use in 1906. The plants of this variety under shade reach a height of about 7½ ft. at the time of maturity. The leaves have a partially erect habit of growth, the seed production is comparatively small, and the time of maturity very early. The average number of leaves per plant is about 21 after topping, and the yield may reach, under favorable conditions, 1,400 lbs. of cured tobacco to the acre. The percentage of the best grades of tobacco in the crops grown has been high. The leaves are about 18 in. long and 15 in. wide and of a round shape, adapted to economical cigar-wrapper cutting. The grain in the leaves is evenly distributed from the tip to the base; the veins are small and fine; the burn excellent, leaving a white to gray colored ash, and the tobacco has sufficient body and stretch so that when wrapped on cigars it stands handling without injury.

The Brewer Hybrid and Cooley Hybrid tobacco have been previously described (E. S. R., 18, p. 35).

The effect of climatic conditions on the composition of durum wheat, J. A. LeClerc (*U. S. Dept. Agr. Yearbook 1906, pp. 199–212, pls. 2*).—The value of durum wheat as a source of human food is discussed and the factors which influence the quality of the grain are noted. Cooperative work on this subject has been in progress for 2 years, and the comparison in this article is limited to Kubanka, a Russian or northern wheat, and Pelissier and Marouani, Mediterranean wheats from Algeria, these being the varieties grown in many different localities during this time.

The analytical results of wheat grown in arid and humid regions in 1903 show a difference of 0.57 per cent of nitrogen in favor of wheat grown in the drier localities. The percentage of ash and of phosphoric acid was influenced but little, while the weight per thousand grains was generally considerably higher in wheat from the humid and irrigated regions. It was further observed that the arid and semiarid regions produced the largest percentage of flinty grains.

In 1904 Kubanka wheat was grown in 7 localities with 15 in. or less of rain fall, and in 6 localities with more than 15 in. of rainfall or having irrigation. The grain from the drier regions contained 0.47 per cent more nitrogen than the grain produced under the more humid conditions. In other work done in 14 different localities in the Western States wheat from 7 of the places where irrigation was practiced contained on an average 12.1 per cent of protein and wheat from the remaining 7 places without irrigation contained 15.4 per cent.

A comparison of irrigated and nonirrigated durum wheats grown in Mexico showed that the irrigated wheat contained 11.1 per cent of protein and 20 per cent of flinty grains, and the nonirrigated wheat 17.7 per cent of protein and 100 per cent of flinty grains. The seed from which this wheat was grown had a protein content of 12.3 per cent, 100 per cent of flinty grains, and a weight of 38.8 gm. per thousand grains. The weight per thousand grains of the irrigated and nonirrigated samples was 29.4 and 29.2 gm., respectively.

A number of samples of Kubanka wheat were grown in Idaho and Colorado under dry-land farming and under irrigation. The dry-land samples contained on an average 2.75 per cent of nitrogen, 2.12 per cent of ash, and 1.07 per cent of phosphoric acid. The weight per thousand grains was 30.3 gm., the weight per bushel 60.9 lbs., and the percentage of flinty grains 98. The samples produced under irrigation showed an average content of 2.02 per cent of nitrogen, 2.11 per cent of ash, and 1.03 per cent of phosphoric acid, together with a weight per thousand grains of 36.6 gm., a weight per bushel of 62.7 lbs., and 55 per cent of flinty grains.

The effect of long and short periods of growth on nitrogen content and weight was also studied. The growing period of the samples under observation varied from 71 days in Oklahoma to 254 days in Washington, where the sample was grown as a winter variety. The difference in the average results between the short and long growing periods was 0.35 per cent of nitrogen, or 2.1 per cent of protein, the larger percentage of nitrogen being, as a rule, associated with the shorter growing period. It is pointed out that at North Enid, Okla., with 71 days as the growing period and 64° as the average temperature of that period, 4,544 heat units were necessary to mature the crop, while at Idalia, Colo., 157 days, with an average temperature of 58°, or 9,106 units, were required.

In studying the effect of the time and manner of harvesting, it was observed that when only the heads are harvested early the grain is small and shriveled and when harvested late the grain is plump. It was found that the percentage of nitrogen and protein was practically the same in every sample whether harvested early or late, heads separate or the whole plant, and whether the samples were protected or exposed. In the weight per thousand grains the samples harvested late weighed from 7 to 10 gm. more than those harvested early. It was also shown that the weight per thousand grains where the heads only were harvested early was 26.3 gm. and where the whole plant was harvested at the same time 28.9 gm.

Several hundred analyses made by the Bureau of Chemistry of American spring and winter wheat grown in different States show an average protein content of 12.2 per cent, as compared with 14.7 per cent for over 100 samples of durum wheat analyzed by the author.

HORTICULTURE.

Tests of the vitality of vegetable seeds, E. H. Jenkins (*Connecticut State Sta. Rpt. 1906, pt. 6, pp. 395–397*).—During the seasons of 1905 and 1906, 713 samples of field and garden seeds were tested relative to their sprouting capacity, the work being done by V. L. Churchill. A brief tabulated summary is given of the results of these tests

Data are given with regard to the average sprouting capacity of Connecticut-grown onion seed tested in 1880 and each year from 1894 to 1906, inclusive. The average sprouting capacity for 13 consecutive years was 77.7 per cent. A comparative test was made of the sprouting capacity of the following varieties: Yellow, Red, and White Globe, White Portugal, and Wethersfield Red. Red Globe gave the highest results with a sprouting capacity of 80.2 per cent, the average for the 5 varieties being about 76 per cent.

Since 1896 the station has made a test of 1,084 samples of onion seed. In the tabulated results the vitality of Connecticut-grown seed is compared with California-grown seed, the seed tested including seed of different ages from that stated to be less than one year to that stated to be between 3 and 4 years old. The California seed gave the best results except with the seed between 3 and 4 years old. Onion seed 1 year old is usually found to have a much lower sprouting capacity than new seed, although seed from a good crop 1 year old sometimes germinates quite as well as new seed from an inferior crop.

A table is also given showing the average, maximum, and minimum vitality found in tests of Connecticut-grown sweet corn less than 1 year old during the years 1904, 1905, and 1906.

The use of anesthetics in the forcing of plants, W. Stuart (*Vermont Sta. Rpt. 1906, pp. 279–293, figs. 2*).—General consideration is given to the importance of anesthetics in the forcing of plants and the results secured by European investigators along this line. The use of anesthetics at the present time is said to be confined almost wholly to flowering shrubs, such as lilacs, viburnums, deutzias, spireas, azaleas, etc. During the season of 1903–4 the author commenced some experiments to determine the value of ether in the forcing of rhubarb, the results of which have been previously noted (E. S. R., 17, p. 249). Further experiments were conducted with a view to determining whether etherized plants might not be forced without the intervention of frost. The results are here given of the work conducted during the season of 1905–6.

The experimental plants were dug early in October, stored in well-protected frames, and treated at different intervals as follows: October 30 to November 1, November 4–6, December 4–6, January 4–6, January 20–22, and February 13–15. In the first 2 trials 8 clumps were selected and divided into 2 equal lots, one of which was etherized, but with no effect. In the remaining trials the same number of clumps was used, these being divided into 4 equal lots, two of which were frozen and one lot each of the frozen and unfrozen clumps etherized. The data obtained from these trials are tabulated and show in all cases a larger total yield from the etherized plants. As in the preceding trials in 1903–4, there was a decided increase in weight of stalks pulled the first 2 pickings. In regard to the effect of freezing it is concluded that freezing rhubarb clumps, at least early in the season, is a necessary process. Etherization does not seem to perform the same function as freezing. Where the temperature is sufficiently low to prevent active growth, however, actual freezing for late forcing may not be necessary.

The writer has also investigated the action of ether on asparagus, potato tubers, apples, and palm seeds, but thus far no definite results have been secured.

An extensive bibliography is given of the literature on the use of anesthetics for forcing purposes.

Promising new fruits, W. A TAYLOR (*U. S. Dept. Agr. Yearbook 1906, pp. 355–370, pls. 8*).—Historical notes are given with descriptions and colored illustrations of several promising fruits and nuts, including the Magnate, Oliver, and Rabun apples, the Early Wheeler peach, the Banner grape, the Josephine persimmon, the Chappelow avocado, and the Alley, Teche, Curtis, Georgia, and Delmas pecans.

An orchard study of the Bitter Root Valley, R. W. FISHER (*Montana Sta. Bul. 66, pp. 67–96, pl. 1, figs. 18*).—An orchard survey was made in order to determine the most successful varieties and methods of orchard management in the Bitter Root Valley. This bulletin contains data with regard to the apple industry in Montana, with special reference to the Bitter Root Valley, the varieties grown, yields, and methods of cultivation, together with suggestions in regard to grafting, pruning, fertilizing, irrigating, harvesting, and marketing. For the benefit of the apple growers of this region, who have recently organized, the text is given of the rules adopted and used by the Hood River apple growers' union of Oregon.

A table is given showing the yields from 1903 to 1906, inclusive, produced from the 3,090 acres of apple trees now in bearing. In 1905 this production amounted to 116,763 boxes, valued at $81,734. Although the 4-year average value per acre was only $20.56, figures are given to show that orchards properly cared for are producing profitable crops. The average yield per acre of all orchards under clean cultivation on elevated land was 121 boxes per year and on bottom land 123 boxes per year. The orchards on elevated land grown in sod produced a yearly average of 54 boxes per acre, and on bottom land 101 boxes per acre, from which there appears a difference in favor of clean cultivation on elevated land of 67 boxes per acre and on bottom land of 22 boxes per acre. Throughout the valley the orchards given clean cultivation, with an occasional cover crop plowed under, are producing the largest crops, although some of the bottom lands produce profitable crops when grown in sod when attention is given to irrigation, pruning, and protection from injury by mice.

Cover crops of clover should not be left more than two seasons, and the best results are obtained when they are plowed under in the spring of the year after they are planted. Where the cover crop is left longer than this the foliage appears to be much lighter in color and the wood growth much less than with trees on land which is plowed every year.

Preliminary notes on the seedling apples of Maine, W. M. MUNSON (*Maine Sta. Bul. 143, pp. 115–139, figs. 14*).—This bulletin contains a history and description of the more important seedling apples originating in Maine. The list of apples herein given is based upon varieties listed and described at different times by Downing, Thomas, Cole, and others, and mentioned in the reports of the Maine Pomological Society. Of such varieties as are now wholly or partly extinct the descriptions are omitted. Illustrations are given of several of the more important varieties.

The winterkilling of peach buds as influenced by previous treatment, W. H. CHANDLER (*Missouri Sta. Bul. 74, pp. 47, figs. 14*).—In this bulletin the effects of severe pruning, thinning, and cultivation in the peach orchard on the hardiness of the fruit buds are discussed, and the results are given of observations made on the hardiness of different varieties.

Observations made in the station orchard during the season of 1903–4 suggest that it is possible to head the fruit trees back so severely as to produce less hardy buds on the following summer's wood. In cases where the heading back is sufficiently moderate to permit the forming of fruit buds near the base of the whips of new wood their chances of living through the winter do not appear to be lessened by the pruning. Buds on vigorous new wood finish their resting period later and are not so readily started into growth by warm periods in the winter to be killed by subsequent cold weather.

In the station orchard the trees having the smallest percentage of buds killed were those trained to a spreading open head and forced by pruning and cultivation to make a vigorous growth. The fruit on trees with spreading heads did not rot so badly as that on trees with dense heads. The fruit on trees making a fairly vigorous growth was larger than that on trees making a smaller growth, except with early varieties, with which a tree making a rather small wood growth is said to bear better fruit. Thinning the fruit enabled the tree to set more hardy fruit buds for the next crop. In those cases in the station orchard where only one side of a tree was thinned, from 5 to 40 per cent more of the fruit buds were killed by a temperature of 6° F. below zero on the side not thinned than on the side thinned.

The fruit buds of such varieties as the Elberta, Crawford, Golden Gate, and Oldmixon are said to kill badly in Missouri, since they finish their resting period early and are easily pushed into slight growth on warm days. Varieties of Chinese Cling and green-twigged types, excepting the Elberta, which are generally late in finishing their resting period, are said to be better adapted for the Missouri climate.

Although no data have been gathered relative to the effect of cultivation on the hardiness of fruit buds, information was received from one fruit grower in Missouri that in the spring of 1906 more buds were found to have come through the winter on a portion of his orchard which had received good cultivation. It is believed that the enhanced growth by cultivation aids in retarding the resting period.

Experiment station work with peaches, C. B. SMITH (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 399–434, figs. 6*).—This is a summary of the important results secured from investigations and experimental work with peaches at the various experiment stations in the United States. The important phases considered include a classification into races and types, tree growth, flower buds, hardiness, physiological characteristics, blooming habits, self-fertility, methods of winter protection, causes and treatment of winter injury, propagation, stocks, location and soil, treatment of trees at transplanting, cultivation, irrigation, fertilizing and cover crops, thinning, pruning, harvesting, shipping, and cold storage. Data are also given in regard to the composition of peaches, canning, and profits, together with an extensive bibliography.

New citrus and pineapple productions of the Department of Agriculture, H. J. WEBBER (*U. S. Dept. Agr. Yearbook 1906, pp. 329–346, pls. 8, fig. 1*).—Descriptions and illustrations are given of 3 new citranges, the Colman, Savage, and Rustic, a new loose-skinned orange, the Thornton, and 7 new pineapples originated under the direction of the author, and named as follows: Deliciosa, Dade, Coquina, Jupiter, Orlando, Jensen, and Biscayne.

The citranges are sister fruits of the Willits and Morton. The Colman is the only citrange thus far secured which has inherited in any marked degree the fuzzy character of the Trifoliate orange. It is practically seedless and very juicy. The Savage appears to be the most fruitful of all the citranges aside from the Rusk. While the fruit of the Rustic is not considered so good as that of the Colman and Savage it produces a bushy, low-growing tree, which it is believed will render it specially desirable for cultivation as a lawn tree or a hedge plant.

With regard to the methods of propagating the citrange varieties, the writer advises that they be budded on 2 or 3 year old seedlings of the Trifoliate orange, and again emphasizes the statement that the citranges must not be confounded with oranges, but are principally of value for culinary purposes and for making citrangeade, for which purpose they are highly recommended.

The new loose-skinned orange the Thornton, is believed to have originated as a hybrid between the pomelo and tangerine, from which cross the tangelo was also produced. As compared with the tangelo, however, the Thornton is sweet and not bitter, resembling an orange more than a pomelo, and from its general characteristics would be classed as a loose-skinned common orange, while the tangelo may be described in general as a loose-skinned pomelo.

The new pineapple hybrids, of which 6 have smooth-margined leaves, are also described in detail.

Pineapple growing in Jamaica, G. L. LUCAS (*Bul. Dept. Agr.* [*Jamaica*], *5* (*1907*), *No. 2–3, pp. 41–43*).—In this article the author states that the cause of the repeated failure of pineapple growing in Jamaica can be attributed to a persistency in ignoring the Red Spanish, generally considered the one profitable and marketable pineapple, and which variety constitutes 90 per cent of all the pineapples grown in countries where the business is successful.

The olive, L. DEGRULLY (*L'Olivier. Montpellier: Coulet & Sons; Paris: Masson & Co., 1907, pp. 223, figs. 94*).—This is a treatise on olive culture. The work is introduced by a botanical study of the olive, written by C. Flahault and formerly published in the annals of the Montpellier National School of Agriculture, 1886. Part 2 is devoted to varieties of olives grown in France, Algeria, Tunis, Italy, and Spain, including the various synonyms, and descriptions of tree and fruit, with notes on the varieties described. This is followed by directions for the cultivation of olives, including soils, methods of propagation, planting, pruning, irrigation, fertilizing, and harvesting. Part 4 consists of descriptions of the various insects and fungus diseases attacking the olive, with suggestions for their control.

Olives and olive oil, A. B. BUTMAN (*Mo. Consular and Trade Rpts.* [*U. S.*], *1907, No. 320, pp. 195–198*).—This is a brief report on the cultivation of olives and their conversion into oil in Italy. It is estimated that fully 2,000,000 acres of land are devoted to olive culture, with an annual average yield of 75,000,000 gal. of oil.

The fermentation of tea, II, H. H. MANN (*Indian Tea Assoc.* [*Pamphlet*] *1, 1907, pp. 17*).—In Part I of this report, which appeared in April, 1906 (E. S. R., 18, p. 42), an account was given of the effect of changes of temperature and thickness of spreading on the leaf, and of the period of fermentation on the process of tea fermentation with relation to the influence of these factors on the pungency, color, and body of tea liquor. The present report deals with the continuation of these investigations, together with the results obtained in an attempt to determine the effect of modifications in manufacture on the flavor of tea liquor.

In the previous work it was indicated that where fermentation was conducted between 78 and 82° F. the process is complete (in the absence of microbes) in about 5½ hours from the time of commencement of brewing. Further fermentation at this temperature had no visible effect on the amount of pungency, body, or thickness of the liquor, which qualities were greatly reduced, however, when fermentation took place in the higher temperatures. In order to produce the best results, a temperature not exceeding 82 to 84° F., a saturated atmosphere, and freedom from microbes were found to be necessary.

An attempt was made to determine whether fermentation could be successfully carried on at a considerably lower temperature than the above, from which the author concludes that fermentation should not be conducted below 75° F., since the increased time necessary to obtain the best color and body of the liquor allows microbes to multiply in greater numbers, and that after about 3 hours the flavor commences to be lost. It is stated that these facts have been unconsciously recognized in the districts where temperatures are low by spreading the leaf much more thickly than is common in warmer areas, in which cases the temperature in the interior of the fermenting mass is always at least from 2 to 3° F. higher than on the outside. The heating of the fermenting house is advised when necessary to obtain a temperature within the best limits of work.

Since the quantity of essential oil in the tea leaf is too small to permit of its being weighed directly, in his present work the author estimated the quantity comparatively by determining the amount of oxygen required to oxidize it completely. This method is explained and a table is given showing the several samples of tea which were thus analyzed as to flavor. It was found that the increase in essential oil during withering amounted to about 15 per cent. As soon as rolling begins there is a very great development of the essential oil, amounting in some cases to over 25 per cent. The oil continues to increase during fermentation, but with gradually decreasing speed. Usually the development of flavor is complete at an early stage during the fermentation process.

In 2 experiments an attempt was made to exclude the action of microbes by the use of chloroform added to the fermenting leaf. There was a considerable increase of essential oil in the chloroform samples, although this treatment is said to lead to a destruction of the enzym responsible for the production of color, as well as a rapid reduction in the soluble constituents of the liquor.

The general results obtained with respect to flavor and fermentation are, in substance, as follows: The whole of the flavor is very rapidly developed after the leaf cells are broken, and does not materially increase after 3 hours of fermentation, when a decline in the flavor is apt to take place though occasionally the amount remains constant. It is believed that this decline may be due to the action of microbes in the fermenting leaf. Up to 86° F. the temperature appears to have little influence on the formation of flavor during fermentation. With regard to the length of time required for the fermentation process there appears to be a conflict, since if the maximum of flavor is to be obtained, the time must be less than 3 hours, while if the maximum thickness of liquor is to be produced, the time should be more than 4 hours. From this the author concludes that if flavor is the primary consideration, the fermentation should be as short as possible consistent with producing a fairly good liquor, whereas if the production of a very high-grade liquor is the primary object, the fermentation should be continued as long as consistent with retaining the most flavor possible (up to 4½ hours at any rate).

Experiments were conducted to determine the amount of air required by fermenting tea. From the average of 3 experiments it is calculated that 4½ lbs. cf fermenting leaf will exhaust the oxygen from 1 cu. ft. of air. In order to obtain the best results the author advises the blowing of moist air into the room in such a way as to insure the air actually in contact with the tea being continually renewed, without, on the other hand, drying the surface of the leaf.

Investigations were also made to determine the influence of firing on flavor, from the results of which it is concluded that firing above 212° F., or long-continued firing even below that temperature and even with almost dry tea, means a loss of flavor. Since slow firing also means a loss of pungency and body, the method of increasing the speed of firing without increase of temperature appears to be restricted to putting a heavier blast on the machine or by using more machines.

Trials were made with the "Paragon" machine to ascertain how the temperature conditions varied on the different trays of an automatic drier. The temperature above the top tray ranged from 99 to 140° F., whereas below the bottom tray the temperature ranged from 236 to 247° F. Only the 2 bottom trays showed a temperature approaching that of the inlet thermometer, which was from 255 to 265° F., from which it appears that this machine is not entirely satisfactory in preventing the tea from being stewed in some of the trays.

The essential points to the ideal firing process are given as follows: A rapid raising of the temperature of the fresh leaf in a current of air sufficiently strong to carry off the moist saturated air and thus prevent stewing, and a rapid firing throughout, in which the leaf itself should never be exposed to a temperature greater than 180 to 200° F., either when wet or after becoming more or less dry. In order to determine this temperature the factory should be fitted with thermometers for taking the temperature actually on the trays, since the inlet thermometer gives in many cases absolutely no idea of the temperature at which firing takes place.

Home-grown tea, G. F. Mitchell (*U. S. Dept. Agr., Farmers' Bul. 301, pp. 16, figs. 4*).—This bulletin contains popular directions for the culture and manufacture of home supplies of tea, in which consideration is given to climatic and soil requirements, planting, cultivation, pruning, and plucking, and the curing of black, sun-cured black, and green teas, together with a note on how to prepare tea for drinking. The bulletin is introduced with a brief history of tea cultivation in the United States.

According to the author the cultivation of the tea plant in home gardens is not only profitable, but at the same time the use of the much adulterated foreign article can be avoided. The crop of an average tea bush during the picking season is given as about 3 oz. of cured tea, or about 18 lbs. to 100 plants.

Notes on the height from the ground at which flower shoots form on grapevines, C. Hugues (*Rivista, 4. ser., 13, (1907), No. 10, pp. 221–226*).—This is a discussion with regard to the location of the first fruit buds on grapevines as influenced by the variety, individuality within the variety, and the effect of climatic conditions during the previous growing season.

The book of the chrysanthemum, P. S. Follwell (*New York and London: John Lane Co., 1907, pp. VII + 97, pls. 20*).—This is a popular work on chrysanthemum culture including its history and progress, together with directions for indoor and outdoor culture of chrysanthemums, both for market and exhibition purposes. Insect pests and diseases and their control as well as the hybridizing and raising of new varieties and the preparation of blooms for exhibition are also considered. In conclusion a large number of lists are given of different types of chrysanthemums recommended for general culture, for exhibition, and for decorative purposes.

This is volume 29 in the series of Handbooks of Practical Gardening, edited by H. Roberts.

Report of the horticulturist, F. A. WAUGH (*Massachusetts Sta. Rpt. 1906, pp. 208–211*).—The principal experiments under way at the station deal with problems in the propagation and pruning of fruit trees and in the systematic study of varieties of fruit. In the present report is given a summary of experiments in mushroom culture conducted in 1904 and 1905 under the direction of F. Canning, and previously noted (E. S. R., 17, p. 971).

As a general result of the experiments the author concludes that mushrooms can often be grown profitably as a catch crop in cellars or under greenhouse benches where conditions are favorable, especially as to a cheap and reliable supply of fresh horse manure. It is further concluded, however, that the stories of sudden wealth accumulated from mushroom growing are mostly fictitious.

FORESTRY.

Report of the forester, A. F. HAWES (*Connecticut State Sta. Rpt. 1906, pt. 6, pp. 369–394*).—This is a report of operations conducted in the experimental plantations, forest nursery, and State forests, of the assistance rendered to private owners of forest planting done by the Middletown Water Company, and of fires reported for 1905 by 42 wardens.

A large number of species of conifers and deciduous trees have been planted in the experimental plats, of which the pines thus far appear to be best adapted for the sandy soil on which the trees are grown. No material difference is noted between the growth of white, Scotch, and Norway pines. The first plantations of pine were made in the spring of 1902. The average height of the white pine at the end of the growing season of 1904 was 26 in., and the average annual growth for 1905 and 1906 was 11 in. At this rate of growth it is estimated that it will take a plantation of white pine 7 years to reach the average height of 6 ft. Of the deciduous trees, white and red oak, chestnut, beech, and black or yellow locust have given the best results, but with the exception of the black locust the growth has been unsatisfactory. With the latter tree, 1-year-old seedlings 2 ft. high set out in April, 1903, had grown to a height of 8 ft. in 1906, and were bearing seed. Catalpa trees have made practically no advance since they were set out in April, 1903, having been killed back every winter.

As a result of investigations the planting of 1-year-old seedlings is recommended in preference to planting acorns and chestnuts for the production of oak and chestnut trees, since the squirrels are apt to do considerable damage to the seed. Where seed is employed a bushel of nuts per acre should be used. The total cost of planting an acre, including the cost of seed, is estimated at $5.50 for chestnut and somewhat less for oak. The expense of purchasing seedlings at $4 per thousand and planting 1 acre with 1,500 trees 5 by 6 ft. apart is estimated at $8.60. When planted 5 by 5 ft. apart, 1,700 trees are required, at a total cost of about $10 per acre. These planting distances have given the most satisfactory results.

As a means of fire protection, a system of fire lines has been established. From past experience in fighting fires these lines are now made 15 ft. wide at an initial cost of about $80 a mile. The work of repair consists of cleaning out twice during the year, at an annual cost thus far of about $15 per mile, although this cost is said to be decreasing each year. For a regular tract of 100 acres it is estimated that 2 miles of fire lines should give good protection if kept in repair.

In connection with the nursery work, observations were made regarding the number of nuts per bushel from the large seeded trees and the number per ounce and pound from the lighter seeded trees. The results are tabulated.

The total stock on hand in the nursery consists of 37,700 2-year-old seedlings and 402,900 1-year-old seedlings.

Considerable advice has been rendered to private owners and systematic working plans have been made by the station when requested. A specimen plan is given here including a general description of the area under consideration, the age of the stand, an outline of planting work, the estimated cost of stock and planting, and the conclusions as to profit.

From the years 1903 to 1906 the Middletown Water Company planted 121,292 trees of various species in the reservoir tract at an expense of $1,662.50. A list is given of the parties who have been supplied by the station with forest seedlings at cost. The total number of trees planted during the year by private owners or corporations was 92,800. The primary purpose of the State forests located at Portland and Union is to disseminate practical information regarding forestry methods, such as improvement by thinning and planting operations. In cooperation with the Forest Service of this Department the station has established permanent sample plats on which the effect of thinning on growth and seedling reproduction will be studied for a series of years.

Reports from 42 fire wardens indicate that from 8,000 to 10,000 acres were burned over during the year 1905.

Progress report of forest administration in Coorg for 1905–6, C. D. McCarthy (*Rpt. Forest Admin. Coorg, 1905–6, pp. 12*).—This is a report of progress made in various forestry operations in Coorg during the fiscal year 1905–6, together with a financial statement. The important features of the report are presented in tabular form.

National forests and the lumber supply, T. H. Sherrard (*U. S. Dept. Agr. Yearbook 1906, pp. 447–452*).—The author discusses the economic phases of the forest problem, the methods of acquiring lumber under the various land laws, the purchase of national forest timber, the effect of the national forests on the price of lumber, and gives a brief account of the management of the national forests.

It is believed that the definite result of the sale of timber from the national forests will be to sustain the lumber business, to maintain a steady range of timber values and thus to lessen speculation as well as to render possible the uninterrupted development of the great industries dependent upon wood.

Census of manufactures, 1905. Lumber and timber products, J. E. Whelchel and H. Gannett (*Bureau of the Census [U. S.] Bul. 77, pp. 69, pls. 5*).—In this bulletin, which forms a part of the report of the census of manufactures for 1905, 30 tables are given containing statistics regarding the various branches of the lumber industry of the United States, including logging, sawing, and planing operations, together with imports and exports of unmanufactured lumber and finished products. Tables are also given with reference to the timber regions of the United States. The tables are discussed in detail, together with brief historical and descriptive notes regarding the lumber industry and the distribution of the more important timber species.

The statistics bear on all the important phases of the industry, including the number of establishments, quantities and value of principal products, capital invested, number of wage-earners, wages paid, and range and distribution of timber species. In a large number of instances the figures for 1905 are compared with those of the census of 1900 and other censuses. In Table 1 a com-

parative summary is given of the statistics of the lumber industry as returned at the censuses of 1850 to 1905, inclusive, with the percentages of increase for each census period. While the number of establishments engaged in the lumber industry was 18,769 for 1850 and 19,127 at the census of 1905, the capital invested in the industry during the same period increased from $41,444,364 to $517,224,128, a gain of 1,148 per cent, and the value of products multiplied almost tenfold, from $60,413,187 to $580,022,690.

Sawmill statistics (*U. S. Dept. Agr., Forest Serv. Circ. 107, pp. 2*).—This circular consists of a compilation of reports received from over 10,000 sawmills in the United States with regard to the operations of 1905. An accompanying table shows the proportions of lumber kiln-dried and surfaced, the amount of slab-wood sold, and the proportion of logs cut on lands belonging to the sawmill operators.

Altogether 1,642 mills reported the use of dry kilns. Kiln-drying appears to be more prevalent in the South and is practiced to a less extent in the Rocky Mountain and Pacific coast States. A much larger proportion of the cut is said to be surfaced at the mills than is kiln-dried. More than 3,900 mills are reported as surfacing a portion of their cut, and for the country as a whole, at least 35 per cent is surfaced before it is shipped. Some 4,000 mills reported sales of slab wood totaling 3,503,287 cords. The percentage of logs cut on lands owned by sawmill operators ranges from 97.4 in California to 34.5 in Washington.

Seasoning of telephone and telegraph poles, H. Grinnell (*U. S. Dept. Agr., Forest Serv. Circ. 103, pp. 16*).—From previous investigations with regard to the seasoning of railroad ties (E. S. R., 15, p. 46) it was determined that seasoned timber will outlast unseasoned when both are in contact with the ground, and that dry wood is more receptive of preservative fluids than green wood. In order to determine the rate of seasoning for poles, experiments were conducted by the Forest Service in conjunction with the American Telephone and Telegraph Company, in which a total of 2,200 chestnut and cedar poles were tested.

This circular contains a description of the experiments, together with the results secured. Considerable tabular data are given with regard to the rate at which seasoning progresses in telephone poles, the effect of the time of year when timber is cut on its seasoning and specific gravity, and the amount of shrinkage during air-seasoning. From the results secured winter-cut wood appears to season more regularly than that cut at other seasons, although it does not for many months at least reach as low weight as spring-cut wood seasoned equally as long. With timber of approximately the same age and growth that cut in winter will have the greatest specific gravity and that cut in autumn the least. Shrinkage of round timbers in air-seasoning is so slight as to be disregarded. When poles are carefully cut checking during air-seasoning is comparatively slight. Serious checking may result, however, if the poles are split or shaken in felling. Whereas from the standpoint of seasoning spring and winter are the best times for cutting, winter cutting appears preferable when custom, availability of labor, and susceptibility to decay are taken into consideration.

Brush and tank pole treatments, C. G. Crawford (*U. S. Dept. Agr., Forest Serv. Circ. 104, pp. 24, figs. 3*).—This circular describes the experimental treatments to determine the effect of various preservatives in delaying the decay of the seasoned poles tested in the experiments noted in the preceding circular.

In the work here described the brush and open-tank methods were used and data are being secured on the relative increase of life of treated over untreated timber, the value of different preservatives, and the effect upon the durability of poles of air-seasoning and of soaking in water with subsequent air-seasoning. Although the test must be carried over a period of several years, information is here given with regard to the capacity of the poles green, seasoned, and soaked to absorb preservatives, the degree of penetration secured with different preservatives, and the comparative cost of treatment by the brush and open-tank methods. The methods of treatment are described and results tabulated.

With regard to the absorption capacity of poles it was found that seasoned poles absorbed nearly twice as much preservative as green poles, and the water-soaking previous to treatment appeared to have no effect on the degree of absorption. With the brush treatments no essential difference has been noted in absorption or penetration due to the season of cutting, while in the tank treatments, where only one preservative was used, the spring-cut poles absorbed most, with the cut of winter, summer, and autumn following in the order given. In the brush method the average cost per pole was about 40 cts., or 29 cts. in the case of creosote, of which 7 cts. represents the cost of oil. By the open-tank process, in which creosote was the only preservative used, the average cost per pole was 67 cts., of which 22 cts. represents the cost of oil.

In an appendix a list is given of the preservatives used, which are all more or less modified distillates of coal tar or pine tar. Plans showing the relative position of the treated, seasoned, and green poles in the two experimental telephone lines are also presented.

Varieties of chestnuts, A. BAGLIONI (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 4 (1907), No. 1, pp. 39–65, figs. 8*).—This is a review of the literature on the edible varieties of chestnuts, including descriptions and range of distribution, together with a list of varieties recommended for planting in Italy. Several of the more important varieties are illustrated.

White oak in the southern Appalachians, W. B. GREELEY and W. W. ASHE (*U. S. Dept. Agr., Forest Serv. Circ. 105, pp. 27*).—In this circular considerable data are given with regard to the importance, distribution, and present stand of white oak, as well as a description of the wood and its uses, the silvical characteristics and requirements of the trees, and suggestions for the management of white-oak forests.

Of the total annual cut of hardwoods in the southern Appalachain regions, excluding Kentucky, white oak forms 49 per cent. The present stand in this region is estimated at 13,102,365 M ft. B. M. Tables are given showing the relation between the diameter breast high and the diameter of different stump heights, the height and diameter of virgin white oak at different ages, and the volume in board feet of white oak in the southern Appalachian region for diameters between 14 and 40 in. arranged in height classes.

Forest planting leaflet (White oak) (*U. S. Dept. Agr., Forest Serv. Circ. 106, pp. 4*).—This circular treats of the white oak (*Quercus alba*) with reference to its form and size, range, habits and growth, economic uses, methods of propagation, planting, cultivation and care.

The Duke's osier-bed by the river Thames between Kew and Richmond, B. V. RAMAIENGAR (*Quart. Jour. Forestry, 1 (1907), No. 2, pp. 152–156*).—The author gives an account of a 6½-acre osier-bed on the estate of the Duke of Northumberland, including a description of the growing stock and notes on the method of working, utilization of produce, expenditures of various kinds, and yield. A table is given showing the income and expenditure for the year 1905, the net revenue being £15 7s. 6d. (about $77) per acre.

Evergreens for South Dakota, N. E. HANSEN (*South Dakota Sta. Bul. 102, pp. 154–217, figs. 26*):—This bulletin is based on the experiments with evergreens conducted at the station for the past 19 years, together with the experience of planters in other parts of the State. It contains popular suggestions for the propagating, transplanting, cultivation, pruning, and management of evergreens, together with notes on winterkilling, snow-traps, and wind-breaks, and on the evergreens in the Black Hills.

Descriptions are given of the varieties of evergreens recommended for planting in South Dakota and a large number of forms are illustrated.

Quinin, camphor, and ipecac, F. J. Rosa (*Bol. Soc. Geogr. Lisboa, 25. ser., 1907, Nos. 2, pp. 89–96; 4, pp. 151–161*).—Historical notes are given with reference to the introduction and cultivation of quinin, camphor, and ipecac in the different countries of the world.

Model shade-tree work (*Woodland and Roadside, 6* (*1907*), *No. 4, pp. 40–42, dgm. 1*).—The shade trees of Newark, N. J., on all public ways and in city parks are under the care of a shade-tree commission, invested with the power to make and enforce regulations. The text is here given of the notice sent to abutting property owners, preliminary to planting operations, and sets forth the methods of the commission. A graphical diagram is also given of the uniform specifications adopted as to methods of planting.

DISEASES OF PLANTS.

Report of the botanist, G. E. Stone and N. F. Monahan (*Massachusetts Sta. Rpt. 1906, pp. 157–190, pls. 2*).—A brief outline is given of the work carried on by the station during the past year, followed by notes on a number of specific investigations.

Among these attention is called to a bacterial disease of cucumbers which has hitherto been rare on cucumbers grown under glass in Massachusetts. In the attack noted the authors believe that the conditions under which the crop was grown had considerable to do with the susceptibility to infection.

A bacterial disease of lettuce is briefly described, the object of presenting the account being to call attention to the disease, as it is reported to be causing considerable damage in numerous parts of the country. The disease results in the appearance of numerous small brownish spots on the young and tender leaves of the head. The spots are frequently quite abundant and in some cases run together, causing the destruction of a portion of the leaves.

A bacterial disease of geraniums, previously noted (E. S. R., 10, p. 648), has been observed every year since 1898. At times this disease becomes quite destructive and, from the authors' observations, is more troublesome on plants exposed to bright sunshine than upon those growing in partial shade.

Attention is called to some tobacco troubles experienced in the Connecticut Valley, particularly one which appears to be caused by improper methods of fertilization and culture. In this case the roots of the plants exhibited characteristic burning, and as there appeared to be no inclination to spread from the infected centers, the trouble is believed to be due to the injudicious use of fertilizers.

The authors state that for a number of years peach twigs showing grayish colored spots with purple margins have been received at the laboratory. An examination of these showed the presence of a species of Monilia, but it was invariably a different species from that known to occur on the fruit. Further investigations will be made to determine the effect of treatment for the San José scale on the development of this disease. In connection with this and other diseases the authors state that the use of lime-sulphur mixture for the prevention of the San José scale has proved decidedly beneficial in reducing the amount of canker, pear blight, black knot, and other diseases.

A series of potato-spraying experiments is reported in which comparisons were made between standard Bordeaux mixture, dry Bordeaux, copper phosphate, and a mixture designated as 1–2–3, which is said to contain compounds of copper, arsenic, and lime. The season was remarkably free from potato diseases and but little difference was noted in the yields of the different plats.

An account is given of the treatment of the college pond with copper sulphate at the rate of 1 part to 4,000,000 parts of water to clear it of bacteria and algal growths. The copper sulphate was applied by placing it in a coarse bag attached to a canoe, which followed concentric circles over the pond until the copper sulphate was all dissolved. Bacterial examinations were made of the water, which showed a marked falling off of the number of bacteria per cubic centimeter immediately after the treatment and a gradual increase subsequently, but the number as long as observations were made did not attain as high a count as in the original samples. Laboratory experiments with pond water were carried on with practically the same results.

A number of substances used for banding trees in connection with the gipsy and brown-tail moth investigations were tested to determine their effect on the trees. Many of these preparations, most of which are proprietary, contain petroleum in some form and were found to be more or less injurious to the trees. The objection made to the use of some of the mixtures was found to be due to the fact that they were improperly used, being applied directly to the trunk of the tree instead of upon paper bands, as recommended by the manufacturers. The authors state that of all the substances tested, Tanglefoot was the only one that did not in any way cause injury to the plant tissues when placed directly on the tree trunk. This substance has a high melting point, which is a decided advantage for the purpose.

The injurious effect of illuminating gas on trees is commented upon at some length.

A study is reported on the effect of soils of different texture on the germination and growth of seeds of various kinds. The compactness of soil as affecting germination and growth was tested by sowing seeds in boxes. In one series the boxes were filled with good loam containing 8 per cent organic matter, one box being tamped firmly and the other left very loose. In another series 2 boxes of subsoil of fine texture were employed. This soil was deficient in organic matter. Lettuce, rattlebox, and white clover seeds were sown in the different boxes. No lettuce seed germinated in the tamped loam or subsoil, while the white clover made its appearance in the tamped loam. The rattlebox seed did better than the lettuce or white clover in the soil of fine texture. All of the seeds germinated better in the loose than in the packed soils.

In another series of investigations the influence of the size of soil particles was tested by seeding with lettuce. The boxes contained sifted coal ashes, the particles of which varied from 0.0001 to 2 mm. in size. The highest percentage of germination was given by the seed sown in ashes containing particles having a size of 1 to 2 mm., while the greatest average weight of the seedlings was produced in the boxes containing ashes the particles of which had a diameter of 0.5 to 1 mm. In similar boxes filled with sand the highest percentage of germination took place in the boxes containing sand the particles of which ranged from 0.25 to 0.5 mm., while the greatest average weight of the seedlings was where the particles were from 0.5 to 1 mm. in size. Attention is called to the important difference between coal ashes and sand in respect to the absorption of moisture.

Parallel experiments were undertaken in shallow plates containing about ½ in. of coal ashes, having the same range in the size of particles as in the previous experiment, to test the effect of aeration on germination, and the results were essentially the same as in the experiment reported.

The occurrence of plant diseases in Vermont in 1906, L. R. Jones and N. J. Giddings (*Vermont Sta. Rpt. 1906, pp. 227–236, figs. 2*).—Miscellaneous notes are given on plant diseases observed during the season of 1906. Among them were a number of diseases of the potato, orchard diseases, and diseases of garden crops.

Observations on the diseases and injuries to wild and cultivated economic plants in 1904, A. A. YACHEVSKI (*Ezhegh. Svyed. Bolyez. ĭ Povrezhd. Kult. ĭ Dĭkorast. Polez. Rast.*, *2* (*1904*), *pp. 119*).—Compiled notes are given on nearly 200 species of parasitic fungi and phanerogams that were observed on cereals, forage and fodder crops, orchard and garden fruits, vegetables, forest trees, ornamentals, etc.

Can phosphates cause chlorosis? T. TAKEUCHI (*Bul. Col. Agr. Tokyo Imp. Univ.*, *7* (*1907*), *No. 3*, *pp. 425–428*).—The author investigated the effect of various phosphates when added to culture media to determine whether they could cause chlorosis of plants. He found that there was no evidence of such action.

Millet smut (Ustilago panici miliacei) and its control, I. N. TRZHEBINSKI (*Vyestnik Sakh. Promuish.*, *1906*, *No. 10*; *abs. in Zhur. Opuitn. Agron.* (*Russ. Jour. Expt. Landw.*), *8* (*1907*), *No. 1*, *pp. 100*, *101*).—The spores adhering to the seeds are successfully destroyed by soaking the latter in a solution containing 0.5 per cent of copper sulphate and 0.25 per cent of formalin.—P. FIREMAN.

The diseases of sugar beets in relation to their culture, M. HOLLRUNG (*Bl. Zuckerrübenbau*, *14* (*1907*), *No. 11*, *pp. 164–171*).—A popular discussion is given of the diseases of sugar beets, the prevalence of which depends upon conditions of cultivation. The author divides the periods of beet growth into the seedling stage, the period during which the roots are developing, and the time of making and storing reserve materials. The especial diseases accompanying each phase of growth are briefly described, and the importance of proper cultivation and fertilization during the different stages is pointed out.

The control of Texas root rot of cotton, C. L. SHEAR and G. F. MILES (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102*, *pp. 39–42*, *fig. 1*).—A description is given of root rot of cotton due to a fungus which is referred to the genus Ozonium. In investigations carried on to control this disease, the application of fungicides and fertilizers to the soil and selection have been undertaken without any great promise of success. Based upon field and laboratory observations, the authors concluded that a lack of proper aeration of the soil is a prominent factor in favor of the development of the root fungus, and consequently a series of experiments was planned in which deep plowing in the fall, deep spring plowing, and spring subsoiling were compared.

The results obtained were so remarkable that the authors recommend as an efficient treatment deep fall plowing combined with a rotation of crops for 2 or 3 years previous to planting cotton on the land. The land should be plowed to a depth of at least 7 in., and for this purpose disk plows are recommended. In the experiments of the authors the plowing was done in December, and it is believed that still better results would have been secured had the soil been turned in November, thus giving a greater opportunity for aeration.

Potato spraying experiments, L. R. JONES and N. J. GIDDINGS (*Vermont Sta. Rpt. 1906*, *pp. 265–269*).—In continuation of the station's policy of conducting spraying experiments with potatoes for a number of years, the trials during the year covered by the report were conducted with two aims, (1) to learn the gain from the use of Bordeaux mixture and (2) the relative values of a number of commercial fungicides.

The tests of the gains from the use of Bordeaux mixture were in continuation of experiments that have been in progress for 16 years. Potatoes grown on sandy loam sprayed with Bordeaux mixture gave an increase of 28 per cent in total yield and 31 per cent in marketable crop, while potatoes grown on clay loam gained 74 per cent in total yield and 68 per cent in marketable crop.

The spray compounds used in the second portion of the experiments to compare with Bordeaux mixture were copper phosphate, dust Bordeaux, and a mixture designated as 1-2-3, which is a combined insecticide and fungicide containing arsenic in some form. The results in this series were unsatisfactory on account of the appearance of the blackleg disease, described below, and comparisons can not be sharply drawn. All of the experiments, however, showed by the appearance of the plants that the use of these compounds was favorable. None of the compounds appeared to injure the potato foliage in any way and all seemed to exert some tonic effect upon the plant aside from their fungicidal and insecticidal value.

The blackleg disease of the potato, L. R. Jones (*Vermont Sta. Rpt. 1906, pp. 257-265*).—This disease, which is said to be well known in Europe, was under the author's observation in Vermont in 1906. His attention was first drawn to it about the middle of July, when the plants were about 10 in. high. The most conspicuous symptom at this time was that the plants were below normal size, of a pale or yellowish-green color, and the leaves were more erect, giving the plant a decidedly narrowed aspect.

The author is not fully satisfied as to the cause of the trouble, and he presents various theories regarding its possible origin. Among these are the parasitism of a species of Rhizoctonia, bacterial troubles, etc. In addition the author states that an appearance almost identical with blackleg disease was produced by application of Paris green to some of the plants, the amount applied being so great as to become so lodged on the lower parts of the stems as to be plainly visible.

The leaf-blotch disease of the potato caused by Cercospora concors, L. R. Jones and C. S. Pomeroy (*Vermont Sta. Rpt. 1906, pp. 236-257, figs. 3*).—The occurrence of the leaf-blotch disease of the potato caused by *C. concors* has been previously noted (E. S. R., 18 p. 948).

This disease made its appearance on early potatoes grown in fairly rich garden soil about the time when the plants were in early blossom. A close examination of the discolored leaves showed the presence of a fungus covering the spots, the fungus being most conspicuous on the lower surface of the leaves. The spots increased somewhat rapidly, so that by the middle of July most of the lower leaves were affected. In some cases the invaded portions blackened and died, while the rest of the leaf remained a yellowish green, somewhat resembling the appearance caused by early blight.

A study of the fungus showed that it was *C. concors*, and in the authors' opinion, while not before reported as occurring in this country, it has doubtless been present for a considerable time. Its occurrence at the same time as early blight and its general resemblance to this disease have no doubt led to the confusion of the two diseases. It is believed that the distribution of this fungus will be affected by summer heat and that it will probably not be found south or west of New York.

Spraying with Bordeaux mixture is recommended as a preventive, and marked differences in varieties regarding resistance to this disease are noted. The early varieties seem to be most subject to it.

Bitter pit in apples, J. B. Farmer (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1907, No. 6, p. 250*).—In continuation of reports on the bitter pit of apples received from Cape of Good Hope (E. S. R., 18, p. 554) the author calls attention to the fact that in badly attacked varieties the disease was not confined to any special region of the apple. All attempts to establish a fungus or bacterial origin have failed, as well as cultural experiments to demonstrate the presence of a parasite. The disease seems always to develop within the flesh of the apple and to extend outward toward the skin, and in many specimens received no trace of the disease was noticed until the fruit was cut open, when the characteristic brown spots were easily identified.

In the author's opinion, the disease is due to some obscure physiological causes, and, as the cells of the affected area are always full of starch, either the pathological condition tends to affect the formation of the starch, or, more probably, the action of diastase is locally inhibited.

The leaf-spot fungus of apple and other fruit trees, J. L. SHELDON (*Torryea, 7 (1907), No. 7, pp. 142, 143*).—In a publication of the Virginia Station (E. S. R., 4. p. 354) the brown spot disease of apple was doubtfully attributed to the fungus *Phyllosticta pirina*. This same fungus has since been found to occur on the leaves of pear, quince, apple, and plum, causing a disease variously known as brown spot, leaf spot, frog eye, etc.

The author has made an examination of a considerable number of specimens of the fungus and finds that the spore characters do not agree with those originally described for the above species. From the color and other characters he believes it advisable to transfer the fungus from the genus Phyllosticta to the genus Coniothyrium, and the name *Coniothyrium pirina* is proposed.

Die back of peach trees, F. M. ROLFS (*Science, n. ser., 26 (1907), No. 655, pp. 87–89*).—The author notes the occurrence at the Missouri State Fruit Experiment Station of the die back of peach trees, due to *Valsa leucostoma*, a fungus that has been previously reported as seriously attacking cherry trees in Germany and elsewhere.

The investigations carried on at the Missouri Fruit Station indicate that the fungus is an active parasite, attacking the twigs, limbs, and trunk of peach, plum, apricot, and cherry trees. On the peach infection occurs through the buds and wounds at any time during the growing season, but its development is most noticeable during the spring months. Alternate freezing and warm periods during the winter favor the growth of the organism, and it often makes considerable advancement during the warm weather in the winter, the young shoots being frequently killed back from 2 to 15 in. Twigs killed during the winter months at first have a dark purplish color, but later the epidermis and infected areas become leathery and change to scarlet or purple, and finally to a drab color. The diseased portion of the twig soon becomes constricted, making a sharp division between the dead and living tissue, and at this point gum pockets are formed, which usually produce a copious gum flow. During the spring and summer the foliage of the infected twigs frequently wilts suddenly and takes on a blighted appearance, due to the girdling of the stems.

Infections on the older branches during the winter and early spring produce oblong wounds and the epidermis covering such wounds cracks and falls away. A callus soon forms on the edge of the injury and finally covers the exposed tissue, but does not unite. On the larger limbs and trunk, especially on the southwest side of the tree, large cankers or sun-scald wounds are formed.

On the infected areas of the limbs and trunk *Cytospora rubescens* and *Valsa leucostoma* usually develop. Inoculations made with pure cultures of *V. leucostoma* produced wounds on which *C. rubescens* invariably developed, and inoculations with pure cultures of Cytospora on peach and plum trees resulted in a constant development of that fungus.

From his experiments the author believes it safe to conclude that *C. rubescens* is the pycnidial form of *V. leucostoma*. The pustules of the two forms are constantly intermingled and resemble each other so closely that it is impossible to distinguish them without the aid of a microscope.

The Japanese plum was found to be affected in the same way as is reported for the peach.

Some observations concerning the American gooseberry mildew during the summer of 1906, G. LIND (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 1, pp. 65–73*).—A discussion of the appearance of the fungus in Sweden, the susceptibility of different varieties of gooseberries to the disease, preventive measures, etc.—F. W. WOLL.

A coffee disease in Salvador, D. J. GUZMAN (*Com. Par. Agr. [Mexico] Circ. 60, pp. 24, pls. 6*).—A description is given of a disease of coffee due to attacks of *Stilbum flavidum*, together with observations regarding the distribution of the fungus, and its effect on the crop. Spraying with Bordeaux mixture is said to hold it in check. Under the prevailing conditions the disease seems most favored during the months from March to May, particularly on those estates where the cultural conditions are favorable for the development of the fungus.

The fungus parasites of the tea plant, N. N. VON SPESCHNEW (*Die Pilzparasiten des Teestrauches. Berlin: R. Friedländer & Son, 1907, pp. 50, pls. 4*).—A report is given on the various species of parasitic fungi known to occur upon the tea plant, most of the information being drawn from the author's investigations in the Caucasus, but supplemented by data from other tea-growing countries. The fungi, of which 22 species are described, are grouped according to whether they occur on the leaves, stems, or roots. After technical descriptions of the different species and accounts of their distribution, injury caused, etc., suggestions are given for their control by spraying or by cultural methods, so far as any are known.

A serious chestnut disease, W. A. MURRILL (*Jour. N. Y. Bot. Gard., 7 (1906), Nos. 78, pp. 143–153, figs. 7; 81, pp. 203–211, figs. 6*).—Attention is called to a serious disease of a native chestnut tree, which is said to threaten the extinction of this valuable tree in and about New York City. The same disease is said to have been found in New Jersey, Maryland, and Virginia.

The number of dead and dying chestnut trees led to the suspicion that the trouble was due to a fungus, and cultures were made which readily developed on agar, bean stems, sterilized chestnut twigs, etc.

The fungus works beneath the cortex in the layers of inner bark and cambium, and its presence is first indicated by the death of the cortex and the change of its color to a pale brown, resembling that of a dead leaf. Later the fruiting pustules push through the lenticels and give the bark a rough, warty appearance. In its effect on the host, the fungus may be classed as a destructive parasite, young trees often being destroyed in 1 or 2 years, while older ones lose their branches to such an extent as to materially impair the vigor of the tree. The fungus, while being primarily injurious to the living tissues, causes greater damage by its habit of girdling the stems and twigs, thus cutting them off from further development.

At present the method by which the fungus enters the tree is a matter of conjecture, but it probably gains entrance through wounds, as the author's experiments failed to produce the disease as long as the thin brown layer of the cortex remained intact.

Experiments in which young trees were sprayed with Bordeaux mixture did not give very satisfactory results.

In the second paper, which was issued early in the fall, the author reports the rapid spread of the disease throughout the New York Botanic Gardens, so that hardly a tree has escaped infection. So far as known, the fungus does not attack any other species of tree, either in this country or in Europe. The organism has been recognized as a species of Diaporthe.

A new chestnut disease, W. R. MURRILL (*Torreya, 6 (1906), No. 9, pp. 186–189, fig. 1*).—A technical description is given of *Diaporthe parasitica* n. sp., a destructive fungus occurring on the American chestnut in New York, New Jersey, Maryland, District of Columbia, and Virginia. An account of this disease is given above.

Is it possible to combat the nematode by means of fertilizers? VIMMER (*Vyestnik Sakh. Promuish., 1906, No. 3; abs. in Zhur. Opuitn. Agron.* (**Russ.** *Jour. Expt. Landw.*), *8 (1907), No. 1, pp. 99, 100*).—The author answers this question in the affirmative, provided strong nitrogenous, phosphatic, and potash fertilizers are jointly applied.—P. FIREMAN.

A select bibliography of Italian mycology, G. B. TRAVERSO (*Flora Ital. Crypt., 1 (1905), No. 1, pp. 135*).—A list of about 1,500 titles relating to Italian mycology is given, arranged alphabetically by authors. In many instances the substance of the different articles is briefly indicated.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The game warden of to-day, R. W. WILLIAMS, Jr. (*U. S. Dept. Agr. Yearbook 1906, pp. 213–224*).— A historical statement is given of the legal status and powers of the game warden in various parts of this country, beginning with the appointment of moose wardens in Maine in 1852. At present game wardens have control of nearly all birds and animals in the different States and Territories. In some localities their work is far more effective than others on account of the friendly attitude of sportsmen and others concerned in the regulations for game protection.

The birds of North and Middle America, R. RIDGWAY (*U. S. Nat. Mus. Bul. 50, pt. 4, pp. XVII + 973, pls. 34*).—In this continuation of the author's descriptive work on the birds of North America, detailed accounts are given of the birds of the following families: Turdidæ, Zeledoniidæ, Mimidæ, Sturnidæ, Ploceidæ, Alaudidæ, Oxyruncidæ, Tyrannidæ, Pipridæ, and Cotingidæ.

The birds of the Chicago area, F. M. WOODRUFF (*Chicago Acad. Sci., Bul. Nat. Hist. Survey No. 6, pp. 221, pls. 12*).—Notes are given on the time of appearance and the frequency of occurrence of the birds observed in the northern portion of Illinois and Indiana, including a territory about 50 miles square. In addition to the notes regarding the occurrence of each species, brief mention is made of influences which are prejudicial to the multiplication of birds and on the migration and local habits of birds observed in the area under discussion.

The birds of Iowa, R. M. ANDERSON (*Proc. Davenport Acad. Sci., 11 (1907), pp. 125–417, map 1*).—An annotated list is presented of the birds observed in Iowa with mention of their feeding habits and economic importance, migration, relative abundance, breeding habits, and distribution.

Birds that eat scale insects, W. L. MCATEE (*U. S. Dept. Agr. Yearbook 1906, pp. 189–198, figs. 3*).—Lists are given of the birds known to feed upon various scale insects in this country, particularly black olive scale, oak scale, and scale insects as a group. In all, 57 species of birds are reported as feeding upon scale insects. These birds are distributed in 12 families, including woodpeckers, orioles, sparrows, warblers, wrens, nuthatches, etc. It is urged that the assistance rendered by birds in the destruction of scale insects is quite important.

Cage-bird traffic of the United States, H. OLDYS (*U. S. Dept. Agr. Yearbook 1906, pp. 165–180, pls. 2*).—According to statistics gathered by the author about 300,000 cage birds, chiefly canaries, are annually imported into the United States. An account is given of the various species of birds thus imported, their value, method of capture, shipment, care, and sale. The imported cage birds come from Europe, Asia, Africa, Australia, and elsewhere. It is suggested that the industry of raising cage birds might profitably be increased in this country.

Food habits of Kansas lizards and batrachians, F. A. HARTMAN (*Trans. Kans. Acad. Sci., 20 (1907), pt. 2, pp. 225–229*).—Observations were made on several species of lizards and batrachians observed in Kansas. In general the lizards were found to live chiefly upon grasshoppers, crickets, and beetles for the most part belonging to harmful species. The batrachia show a wider range of diet, but they feed chiefly upon insects. Lizards as a class are more active in this respect than batrachia, with the exception of the toad, which is the most beneficial of all.

Is the Gila monster a poisonous reptile? F. H. SNOW (*Trans. Kans. Acad. Sci., 20 (1907), pt. 2, pp. 218–221*).—In the author's experience no direct evidence has been obtained that the bite of the Gila monster is poisonous, but the evidence for the poisonous character of the bite as obtained by other investigators is briefly summarized.

Sex differentiation in larval insects, V. L. KELLOGG (*Biol. Bul. Mar. Biol. Lab. Woods Holl, 12 (1907), No. 6, pp. 380–384, figs. 8*).—Previous experiments by the author have shown that the sex of silkworms can not be influenced by excessive or light feeding of the larvæ during their various stages. The reason for the negative results in these experiments was found upon making a microscopic study of silkworm larvæ. The sexes are already fully differentiated at the time when the first molting appears and probably even at an earlier stage. It is considered, therefore, useless to make further attempts to influence the proportion of the sexes in silkworms by feeding.

Report of the entomologists, C. H. and H. T. FERNALD (*Massachusetts Sta. Rpt. 1906, pp. 199–205*).—Tomato plants in greenhouses may be freed of white fly by fumigation with hydrocyanic-acid gas. Considerable attention was given to the study of root maggots and remedies for scale insects. Brief notes are also given on the insect pests of the year and on cranberry insects and the oriental moth.

Three injurious insects, (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua Bol. 5, pp. 23, pls. 2, figs. 3*).—Economic and biological notes are given on grasshoppers, peach aphis, and fall webworm. In combating grasshoppers the best results have been obtained from the use of a bait poisoned with Paris green. In the control of peach aphis great success has been had from the application of fertilizers and bisulphid of carbon to those plant lice which are located at the base of the trunk.

A contribution to the physiology of the museum beetle (Anthrenus museorum), A. J. EWART (*Jour. Linn. Soc. [London], Zool., 30 (1907), No. 195, pp. 1–5*).—The museum beetle is reported as causing great damage to dried plants in the national herbarium at Melbourne. The herbarium specimens have to be fumigated with carbon bisulphid at least once annually in order to prevent their destruction. An analysis of herbarium specimens showed that they contain as a rule from 9 to 11 per cent of water. The larvæ of the museum beetle appear to thrive on plants which contain less than 9 per cent of water.

An attempt was made to determine the source of the water in the body of the larvæ. A part of the water appears to be of a chemical nature, being derived from the carbohydrates in the food of the larvæ by decomposition under the action of bacteria and digestive juices. In the protection of herbarium specimens against museum beetles, it is recommended that care be exercised to exclude all materials which may absorb water.

Acariosis of oats, P. MARCHAL (*Ann. Inst. Nat. Agron., 2. ser., 6 (1907), No. 1, pp. 185–196, figs. 3*).—A description was given of the malformation caused in the head of oats by parasitism with *Tarsonemus spirifex*. This mite has caused serious injury to oats, particularly in the department of Vienne. The mite attacks chiefly oats, but is also found on barley, wheat, and other cereals. The application of an abundance of fertilizers is recommended in preventing injury from this mite.

Hylemyia coarctata, BÖRNER (*Mitt. K. Biol. Anst. Land u. Forstw., 2 (1907), No. 4, pp. 60–63, figs. 2*).—The injury caused to rye and wheat by this insect varies greatly in different years. Apparently there is no practical remedy which may be applied directly against the pest. Deep plowing of infested fields may be depended upon to bring about favorable results.

Some recent studies of the Mexican cotton boll weevil, W. D. HUNTER (*U. S. Dept. Agr. Yearbook 1906, pp. 313–324, pl. 1, fig. 1*).—According to the observations and experiments of the author and his associates it appears that the influences which assist in the control of the cotton boll weevil arranged in the order of importance are as follows: Heat and dryness during spring and summer, the ant *Solenopsis geminata* and other predaceous insects, winter cold and moisture, proliferation of the cotton bolls, parasites, cotton leaf worm, determinate growth of the cotton, and birds. The work of the ant is believed to deserve special attention. It is distributed through the cotton belt and is shown to be an important enemy of the weevil in Central America. Detailed notes are given on the percentage of weevils destroyed by this ant in cotton bolls and squares. A general description is also given of the status of the cotton boll weevil in 1906 and on practical methods for avoiding serious injury from the weevil.

The Duki fig-tree borer of Baluchistan, E. P. STEBBING ([*Indian*] *Forest Bul. 10, pp. 8, pls. 2*).—*Batocera rubus* has been reported as a fig pest since 1895. It seems not to be very widely distributed. The appearance and life history of the pest are described. It tunnels inside the stem and branches of the tree and is, therefore, difficult to combat. The only practical remedy suggested is the destruction of badly infested branches and trees.

Parasites of the grapevine, E. DURAND (*Flore et Faune des Parasites de Vigne. Montpellier: Coulet & Sons, 1907, pp. 89, figs. 55*).—Analytical tables are presented for the ready identification of the common insect pests and fungus diseases of grapes. Descriptive and economic notes are presented on these pests and recommendations are made regarding the most efficient remedies to use in combating them.

The biology and means of combating phylloxera, MORITZ (*Mitt. K. Biol. Anst. Land u. Forstw., 2 (1907), No. 4, pp. 64–66*).—The number of dead and decomposing tubercles on the roots of infested grapevines increases with the season. In combating the phylloxera the author made a comparative test of the 3 cresols and found that orthocresol was considerably more efficient than the other two.

Parasites of the olive fly, F. SILVESTRI (*Coltivatore, 53 (1907), Nos. 23, pp. 710–717; 24, pp. 742–745*).—The life history and importance of the parasites of the olive fly are discussed by the author, partly from a controversial standpoint, frequent reference being made to work along the same line by A. Berlese. It is maintained that the common parasites of the olive fly attack the living larvæ and that the ovipositor is sufficiently long to reach the larvæ in any of the olives cultivated in Italy. The parasites develop rapidly and destroy the larvæ except in cases of very slight infestation.

Insects injurious to wood in Italy, G. CECCONI (*Staz. Sper. Agr. Ital., 39 (1906), No. 10–11–12, pp. 945–990, figs. 38*).—Particular attention is given in this account to the injuries caused to trees by *Hylurgus piniperda, Hylesinus fraxini, H. vestitus, Scolytus multistriatus,* and a number of other species of bark beetles.

The large larch sawfly (*Bd. Agr. and Fisheries* [*London*], *Leaflet 186, pp. 8, figs. 8*).—An account is given of the history, appearance, habits, and injurious attacks of *Nematus erichsoni*. The larvæ of this pest may be jarred from infested trees or the trees may be sprayed with hellebore, Paris green, or lead arsenate.

Bombyx pini, G. Rörig (*Min. Bl. K. Preuss. Verwalt. Landw., Domänen u. Forsten, 3 (1907), No. 3, Anz. Beilage, pp. 57–60, figs. 4*).—A brief account is given of the life history and habits of this pest of the pine with notes on its natural enemies. In combating it the use of sticky bands about the trunks of the trees is recommended. They should be applied not later than the end of March. The operation under German conditions costs not more than $4 or $5 per hectare.

The development of the larvæ of Hypoderma bovis, H. Jost (*Ztschr. Wiss. Zool., 86 (1907), No. 4, pp. 644–715, pl. 1, figs. 3*).—The present account of the life history and developmental stages of the ox warble fly is one of the most complete and satisfactory studies of this insect which have thus far been published. The author finds that the egg of *Hypoderma bovis* does not develop on the skin of the host but begins its development in the gastric portion of the esophagus. In this position the first stages of the larva are regularly found in large numbers soon after the season when the warble flies are most numerous.

A majority of the larvæ migrate through the submucous tissue of the esophagus during the season from July to November or occasionally until February and then return to the lower end of the esophagus, from which point they bore their way through the subserous tissues of the thoracic and abdominal cavities and finally reach the spinal canal. In the greater percentage of cases the larvæ, in making this migration, follow the mediastinum, pillars of the diaphragm, renal capsule, and intermuscular connective tissue of the lumbar muscles.

In the spinal canal the larvæ live largely in the epidural tissue where they are found, as a rule, from December to March. After remaining about 3 months in this position the larvæ wander outward through the intervertebral foramina and finally reach the subcutis, where they remain from January until June.

As a rule, the life cycle of this insect requires about a year and 9 months. Some of the larvæ seem to be greatly delayed in their development and a few may fail to complete their growth. The larvæ of the first stage are supplied with rows of spines.

The rôle of the wood tick in Rocky Mountain spotted fever, and the susceptibility of local animals to this disease, H. T. Ricketts (*Jour. Amer. Med. Assoc., 49 (1907), No. 1, pp. 24–27*).—A study of the life history of the wood tick disclosed the fact that it may be found at almost any time during the winter attached to horses and cattle. The tick is almost everywhere present in the region where spotted fever occurs, and numerous experiments with guinea pigs showed conclusively that the disease may be carried by them. Gophers are readily infected with the disease, although they are not quite so susceptible as are guinea pigs. It is likely that gophers are largely responsible for the maintenance of the disease.

Ticks on fowls, A. Hempel (*Bol. Agr. [São Paulo], 7. ser., 1906, No. 10, pp. 473–475*).—The life history and habits of *Argas persicus*, *A. miniatus*, and *A. reflexus* are briefly described.

The comparative effect of certain poisons on insects, J. Barsacq (*Rev. Sci. [Paris], 5. ser., 7 (1907), No. 23, pp. 721, 722*).—A comparison was made to note the effects of barium chlorid, Paris green, and arsenate of lead upon insects in various stages of development, particularly species of Hyponomeuta. In these experiments it was found that the effect of poisons upon insects varies not only according to the amounts used but according to the structure and stage of growth of the insect. The action of poisons is greatly modified by the metamorphosis of insects and appears to be entirely suspended during the processes of molting. Immediately after molting the effect of the poison is manifested most strikingly.

The author believes that in comparing the different effects of poisons, observations should be made on the third day after the poisons are applied and that the average and maximum mortality can be determined more certainly on the seventh or eighth day. Barium chlorid is a very effective insecticide, but must be used at a strength 8 to 12 times as great as arsenicals in order to produce the desired results. It dissolves readily in water, however, and is inoffensive for man. Arsenate of lead appeared not to be as active as Paris green, but caused a rapid paralysis in the insects which ate it.

The zoological bulletin of the division of zoology, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 2, pp. 33–64, pls. 2*).—Brief mention is made of various practical methods for the application of sprays and of other insecticide methods. A spray calendar is also included in the bulletin.

Early spring applications of insecticides for the oyster-shell scale. The occurrence and distribution of San José scale in Vermont, W. Stuart (*Vermont Sta. Rpt. 1906, pp. 293–297, pl. 1*).—Oyster-shell scale is widely distributed in the orchards of Vermont. Infested trees were sprayed in March with lime-sulphur-salt mixture, prepared according to the formula 25:16.5:16.5:50. The mixture was boiled with steam. This insecticide gave better results than any of three proprietary remedies compared with it, but not all of the scales were killed. Spring treatment is not recommended for this insect.

San José scale has been known to be in Vermont for the past 8 years. Attention is called to the danger of infestation with this insect. Lime-sulphur wash is recommended for eradicating it.

Lime-sulphur washes for the San José scale, A. L. Quaintance (*U. S. Dept. Agr. Yearbook 1906, pp. 429–446, pls. 3, figs. 2*).—Lime-sulphur wash was first used for San José scale in California, and its use has gradually spread over the country. A historical statement is given of the early experiments with this insecticide, together with notes on the importance of the different elements in the wash, the variation in the formulas which have been proposed and the chemical changes taking place in the preparation of the wash. Recommendations are also made regarding the time of application, the necessary equipment for spraying, and the range of usefulness of the lime-sulphur preparations.

Bacteriological studies on foul brood and sour brood of bees, R. Burri (*Bakteriologische Untersuchungen über die Faulbrut und Sauerbrut der Bienen. Aarau: H. R. Sauerländer & Co., 1906, pp. IV+40, pl. 1, fig. 1*).—A series of bacteriological studies was carried out for the purpose of determining the bacterial cause of foul brood and sour brood.

It is found that in Switzerland foul brood may be caused by infection with *Bacillus alvei* and also by another bacillus which appears to be a new species and is difficult to cultivate. The two organisms may be distinguished by the fact that in dead larvæ *B. alvei* is found in the form of rods and spores and produces a strong odor, while the other bacillus causes no odor and is found only in the form of small spores. Other species of bacilli were found not to be connected with foul brood.

Larvæ affected with sour brood are characterized by an acid odor, dirty yellow color, and increased hardness of the chitin coat. In affected larvæ large numbers of bacteria resembling lactic-acid bacilli are found. Both foul brood and sour brood may occur simultaneously in the same hive, but the author believes that foul brood is usually caused by the new species of bacillus which he has discovered.

Report on a disease of bees in the Isle of Wight, A. D. Imms (*Jour. Bd. Agr. [London], 14 (1907), No. 3, pp. 129–140, figs. 3*).—The bee keepers of the

Isle of Wight have referred to a bee epidemic in that island as paralysis, although the symptoms did not agree with those of this disease. The disease in question appears to have been first noticed in 1904 and has spread rapidly since that time, causing serious losses in many parts of the island. Bees affected with the disease are unable to fly more than a few yards and soon die after attempting to crawl up grass stems or other objects.

The disease is confined almost entirely to adult bees and affects chiefly the digestive system; in fact it may be described as an excessive enlargement of the posterior parts of the intestine, particularly the colon and rectum. These parts become distended, chiefly with pollen grains. Certain bee raisers claim that they are able to prevent the occurrence of this disease by artificial feeding of swarms, but this method does not always give satisfactory results. The author recommends the destruction of diseased swarms and the thorough sterilization of the hives.

The bee epidemic in the Isle of Wight (*Brit. Bee Jour., 35 (1097), No. 1302, pp. 221-223, figs. 3.*)—The reports concerning the prevalence of a bee epidemic in the Isle of Wight have been considerably exaggerated. It is now believed that the disease is not paralysis as had been supposed, but is apparently identical with a disease known in Germany as "May" disease.

Annual report of the royal sericultural station, Padua (*Ann. R. Staz. Bacol. Padova, 34 (1907), pp. 125*).—In a preface to this report the director of the station, E. Verson, calls attention to the negligence observed among a considerable percentage of the population in carrying on sericulture in a satisfactory manner. This matter was called to the attention of government officials and a commission was appointed to investigate the status of sericulture. The commission recommended the establishment of a peripatetic chair of agriculture for the purpose of disseminating encouragement and information regarding silk raising.

The present status of sericulture in the provinces of Bari, Foggia, and Lecce is discussed by E. Quajat (pp. 29-39). The causes of flaccidity in silkworms are discussed by E. Verson (40-49). This is believed to be a distinct disease which may arise from the cooperation of a number of predisposing causes. The disease is observed much more frequently when the silkworms are neglected than on the premises of careful and progressive silk raisers. The same author made a study of the effect upon silkworms of washing the mulberry leaves in disinfectants (pp. 50-57). For this purpose fluorid of silver was used in washing the leaves as compared with dry leaves and leaves merely moistened with water. The weight of the cocoons was greatest in case of those which fed upon leaves treated with fluorid of silver, but this increase of weight was apparent rather than real, since the amount of silk seemed to be no greater. The larvæ fed upon disinfected leaves showed no diminution of mortality.

The leaves of *Morus alba* and *M. nigra* were compared as food for silkworms by E. Quajat (pp. 58-80). The quality of cocoons obtained by feeding the worms on *M. nigra* was superior, as was also the tenacity of the silk. The elasticity of the silk was the same in both cases. The same author also gives descriptive notes of 4 races of Chinese silkworms imported into Italy. E. Verson tested the value of tetrachlorid of carbon in killing the chrysalids. This chemical as compared with the ordinary method of steaming was found to have no advantage and injured the silk to some extent. Biological notes are also given on a number of races of the silkworms and on the manner of depositing the eggs. As in previous numbers of this report an elaborate bibliography relating to silkworms has been collected (pp. 107-124).

Some silkworm moth reflexes, V. L. KELLOGG (*Biol. Bul., 12 (1907), No. 3, pp. 152-154*).—The author reports a number of observations in which it appeared that in mating, the male silkworm is guided by the sense of smell. It was also found that headless female moths live as long as normal individuals and lay the usual number of eggs.

The consumption of mulberry leaves as related to the breeds of silkworms and the quality and quantity of silk, P. Bucci (*Staz. Sper. Agr. Ital., 39 (1906), No. 9, pp. 769–816*).—A large number of observations were made regarding the quality of silk as affected by methods of feeding silkworms and the detailed results are stated in tabular form.

Flaccidity of the silkworm, C. Ciarpella (*Arch. Farmacol. Sper. e Sci. Aff., 6 (1907), No. 2–3, pp. 120–126*).—The conditions under which flaccidity occurs in silkworms are briefly described by the author. It is believed that this disease is transmitted by ingesting food contaminated with the pathogenic micro-organism. This organism may be present at any time in the intestines of silkworms, but gains entrance to the tissues of the body at times when the resisting power of the worms is at low ebb.

FOODS—HUMAN NUTRITION.

Hygiene of nutrition, J. Rouget and C. H. A. Dopter (*Hygiène Alimentaire. Paris: J. B. Baillière & Sons, 1906, pp. 319*).—This handbook, which constitutes volume 4 of a series of treatises on hygiene published under the direction of P. C. H. Brouardel and E. Mosny, summarizes and discusses data on vegetables, fruits, and cereals, meat and fish, dairy products, eggs, etc., preparation of food, condiments, preserved fruits, beverages, food adulterations, overabundant and insufficient nutrition, foods as accidental carriers of bacteria and as causes of disease, and related questions.

The nutrition investigations of the Office of Experiment Stations and their results, C. F. Langworthy (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 359–372*).—Attention is directed to the lines of investigation which have been especially followed in carrying on the nutrition investigations of this Office, and some of the principal results obtained are pointed out.

Food value of corn and corn products, C. D. Woods (*U. S. Dept. Agr., Farmers' Bul. 298, pp. 40, figs. 2*).—The structure, composition, and milling of corn, methods of cooking, corn breakfast foods and other corn products, the digestibility of foods made from corn, green corn as a vegetable, and related questions are considered in this summary of available data on the composition, digestibility, nutritive value, and place in the diet of this important cereal. In composition corn compares favorably with other cereal foods. As regards its digestibility, experiments indicate that "the carbohydrates are almost completely utilized by the body, no matter how the grain is cooked. The method of preparation, however, apparently makes considerable difference in the digestibility of the protein. . . .

"The corn breakfast foods and other corn products have much the same digestibility as corn meal when cooked in similar ways. The variations which have been noted with the different corn breads and other corn dishes are of the same character as those observed with similar foods made from wheat flour of different sorts."

Corn, like other grains, "contains too little protein in proportion to its fat and carbohydrates to supply the body with nutritive material in the proper proportion, and it should be combined with materials rich in protein, such as lean meat, milk, cheese, dry beans, etc. When thus combined it is a healthy, nutritious, and inexpensive food and has been proved by common experience to be wholesome, palatable, and a welcome addition to the diet.

"Considering all of its uses, corn is one of the most important cereal foods from the standpoint of palatability, nutritive value, and digestibility. It may be prepared for the table in a great variety of ways, and in some form or other is deservedly used in the majority of American homes."

Nuts and their uses as food, M. E. JAFFA (*U. S. Dept. Agr. Yearbook 1906, pp. 295–312, pl. 1, fig. 1*).—The flavor, composition, and digestibility of nuts and their place in the diet are considered, the preparation and characteristics of nut butter, nut paste and preserves, nut flours, and other nut products are described, and data on the general subject of nuts and their uses as food are summarized.

In general, according to the author, "it may be said that nuts are a very concentrated food, even more so than cheese; but when rationally used they are well assimilated and may form a part of a well-balanced diet. Nuts are a very valuable source of protein and fat, these two nutrients being the characteristic constituents of the more common nuts, of which the walnut and cocoanut may be taken as types. In nuts like the chestnut, carbohydrates are a characteristic constituent. For most families it is undoubtedly wiser to use nuts as part of the regular diet than as a condiment or supplement to an otherwise hearty meal.

"Vegetarians and others who use nuts in place of meat should not depend upon them as the main food supply, but should supplement them with more bulky foods with a low content of protein and fat. As a whole, nuts may be classed among the staple foods, and not simply as food accessories. At usual prices, nuts are reasonable sources of protein and energy. . . .

"Though less subject to contamination than many other foods, nuts should be handled and stored under good conditions, and especially should be protected from dampness and insect enemies."

Infant feeding and infant mortality among the Chinese, WIENS (*Arch. Rassen u. Gesell. Biol., 4 (1907), No. 2, pp. 224–227*).—On the basis of personal observation and other available data the author discusses infant feeding in northern China.

In general, the children are breast fed for 18 months and sometimes for 3 or 4 years. Cow's milk is not used by the Chinese, and when the children are weaned they are given porridge made from wheat flour or from millet meal with millet bread and similar foods, and later eggs and a little meat, that is, they gradually become accustomed to the mixed diet used by adults. In well-to-do families a special sort of rice is used, as well as lotus roots, cakes from bean flour, various dishes made from wheat flour, and fruit. When it was necessary to wean very young children on the cereal products mentioned, fatal results were almost always noted.

A plea for the use of oatmeal in the dietary of children, C. WATSON (*Brit. Med Jour., 1907, No. 2417, pp. 985, 986, figs. 2*).—In the author's opinion, oatmeal porridge is a very satisfactory food for children from the third year onward. "Breakfast is the meal into which oatmeal should most largely enter, the best form of administration being porridge and milk, which should be followed by a glass of milk and some bread and butter." The author believes that it is better to omit meat from the meal. His high opinion of oatmeal is in part based upon the fact that in experiments with young rats the thyroid gland was much more highly developed on oatmeal than on a diet of bread and milk.

Buttermilk feeding, H. C. CARPENTER (*Jour. Amer. Med. Assoc., 48 (1907), No. 19, pp. 1576–1580, dgms. 12*).—A discussion of the uses of buttermilk in infant feeding, with reports of a number of cases. On the basis of experience, the author considers fresh buttermilk most excellent temporary food "for infants suffering from intestinal indigestion, enteritis, and marasmus." No unpleasant effects from the administration of fresh buttermilk have been noted, and infants almost invariably take it well. In the author's opinion, "whatever success has attended the use of buttermilk, is not so much due to the absence of fat as to the great ease with which the proteid of buttermilk is digested. . . . Several who were unable to digest 0.75 per cent of calcium casein digested perfectly the 2 per cent to 3 per cent of casein lactate in the buttermilk."

Milling characteristics of Australasian wheats, F. B. GUTHRIE and G. W. NORRIS (*Agr. Gaz. N. S. Wales, 18* (*1907*), *No. 4, pp. 295–307*).—Percentage of milling products, color of the flour, strength, gluten content, character of the gluten, and other data were recorded for a number of samples of wheats grown in Australia.

The author notes that a number of varieties yield flours of high strength and that they retain this characteristic under cultivation in regions where hitherto rapid deterioration of wheat in this respect has been observed.

Structure of the starch grain, H. KRAEMER (*Amer. Jour. Pharm., 79* (*1907*), *No. 217–229, pl. 1, figs. 3*).—A summary of experimental evidence and other data included in this paper led to the conclusion that "the starch grain consists of colloidal and crystalloidal substances, these being arranged for the most part in distinct and separate lamellæ, that is, at the point of origin of growth, and in the alternate lamellæ the colloidal substance preponderates, associated with the crystalloid cellulose; whereas in the other layers the crystalloidal substance, consisting for the most part of granulose, occurs in greater proportion."

The chemical composition of cooked vegetable foods, II, KATHARINE I. WILLIAMS (*Jour. Amer. Chem. Soc., 29* (*1907*), *No. 4, pp. 574–582*).—The author reports an extended study of the composition of cooked cereal foods as compared with the raw product. Earlier work has been noted (E. S. R., 15, p. 885).

The pentosan and methyl pentosan content of vegetables, J. SEBELIEN (*Chem. Ztg., 30* (*1906*), *p. 401; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 13* (*1907*), *No. 10, p. 638*).—The author distilled with hydrochloric acid a number of vegetable products, such as wood of different sorts, hay, seaweeds, barley, bran, oil cakes, carrots, and turnips, and found that the resulting furfurol contained only small amounts of methyl furfurol and that the ratio of methyl pentosan to pentosan was usually less than 1. Carrots and turnips, he states, contained respectively 2.59 and 2.93 per cent methyl pentosan on a dry-matter basis, and 8.43 and 6.67 per cent pentosan.

Dika butter, E. MILLIAU (*Agr. Prat. Pays Chauds, 7* (*1907*), *No. 48, pp. 189–199*).—Dika butter, a culinary fat prepared from the seeds of *Irvingia gabonensis*, is, the author believes, destined to become an important article of diet. It possesses a delicate flavor not unlike that of cocoa butter and resembles this and other vegetable culinary fats in chemical character, as the analytical data show. The method of manufacture is described. The cake remaining after the extraction of the fat is stated to be an important feeding stuff. When well prepared, dika butter has a decided advantage in that it does not readily spoil.

Concerning cocoa and chocolate, J. DEKKER (*Arch. Pharm., 245* (*1907*), *No. 2, pp. 153, 154*).—A polemical article.

The quantity of calcium oxalate in cinnamon and cassia bark, J. HENDRICK (*Analyst, 32* (*1907*), *p. 14; abs. in Chem. Ztg., 31* (*1907*), *No. 24, Repert. No. 21, p. 126*).—None of the cassia samples contained as much calcium oxalate as the lowest amount found in cinnamon bark. The investigation also showed that wild cinnamon could be distinguished from ordinary Ceylon cinnamon, since it contains about twice as much calcium oxalate.

The examination and valuation of raspberry juice and raspberry sirup, P. BUTTENBERG (*Arch. Pharm., 245* (*1907*), *No. 2, pp. 81–97*).—A summary of investigations on the subject with special reference to determining the purity of raspberry juice and raspberry sirup.

Marmalade making by English methods, C. RAPP (*Die Marmeladenfabrikation nach englischem Verfahren. Magdeburg and Vienna: Schallehn & Wollbrück, 1907, pp. 124, figs. 44; rev. in Österr. Chem. Ztg., 10 (1907), No. 8, p. 107*).—The author discusses materials used in marmalade making, different sorts of machinery, handling and shipping goods, and related questions.

Concerning Liebig's meat extract, II, KUTSCHER (*Zentbl. Physiol., 21 (1907), No. 2, pp. 33–35*).—Oblitin, histidin, and a new meat base for which the tentative name "vitiatin" is proposed, were identified as constituents of meat extract. Vitiatin is apparently related to guanidin, methylguanidin, dimethylguanidin, creatin, and creatinin, and the author hopes that it will prove to be the mother substance of these bodies. Earlier work has been noted (E. S. R., 17, p. 790).

Preservation of meat (*Österr. Mil. Ztschr., 2 (1906), p. 1817; abs. in Hyg. Zentbl., 2 (1907), No. 14, pp. 451, 452*).—In the system of preserving meat described, the meat is dried in a vacuum at a temperature less than 0° C. It is stated that the flesh thus dried remains porous, keeps well, and, after soaking in water, closely resembles fresh meat in appearance and flavor.

A contribution to the chemistry of the bleaching of flour, S. AVERY (*Jour. Amer. Chem. Soc., 29 (1907), No. 4, pp. 571–574*).—From experiments which were carried on at the Nebraska Experiment Station with different bleaching agents, the author concludes that "the maximum bleaching effect, without regard to the quantity of the reagent, can be obtained by the use of bromin. The other reagents follow in the order named: Chlorin, sulphur dioxid, nitrogen peroxid. A given weight of nitrogen peroxid will bleach a far greater quantity of flour than the same weight of any of the other reagents mentioned. All samples of flour bleached with nitrogen peroxid, in so far as tested, respond to the Griess test for nitrites. Samples stored in laboratories and in mills where bleachers are used, commonly respond to the same test. A sample exposed, however, for 13 months in an office not containing any electric or gas lights failed to respond to the Griess test.

"A sample of the flour under consideration was placed in a layer $\frac{1}{64}$ in. thick between plates of glass. The plates were bound together at the edges with adhesive tape. The whole was exposed to the action of sunlight by placing in direct sunlight and reflecting also the rays against the reverse side by a mirror. The sample was bleached by an exposure of 2 hours.

"Nitrogen peroxid mixed with an excess of ozone shows the same bleaching effect as when mixed with air. The bleaching is due solely to the peroxid present."

The specific yellow coloring matter of wheat occurs dissolved in the wheat oil and may be extracted with benzene or other solvents, the extracted flour, as the author points out, being almost white. It was found that exposure to direct sunlight removed the color of a benzene solution of wheat fat in 3 hours. When a sample was shaken with a very dilute solution of nitrous acid bleaching was instantaneous. With dilute bromin water the effect was less rapid. Slow bleaching was effected with a solution of sulphurous acid in large excess.

"Hydrogen peroxid solution, on shaking with the benzene solution of the oil and coloring matter, gave no bleaching effect. This was true in acid, neutral, and basic solutions.

"A solution of the colored oil in acetone was treated with a trace of water and aluminum amalgam. The color was not changed. Zinc dust and acetic acid were also without effect."

As regards the action of reagents on the oil without the solvent, it was found that it was rendered nearly colorless by cautiously applying nitrogen peroxid, chlorin, or bromin. "The first effect is to destroy the yellow color. Secondary effects, such as causing the oil to become red brown, are obtained by an excess of the reagent or by heating or by both."

In the author's opinion, the nitrous acid used in bleaching apparently forms a fairly stable compound, presumably by uniting with the mineral matter of the flour to form a salt. An excess of nitrogen peroxid discolors the gluten of the flour.

On the basis of unpublished data obtained at the Nebraska Station, tests with numerous samples of commercially bleached flour did not indicate that bleaching had any apparent effect on bread-making qualities.

In general, whatever the nature of the coloring matter in wheat flour may be, it appears, according to the investigations reported, to be indifferent to ordinary oxidation or reduction or to acids or alkalis. The minute traces of yellow coloring matter present in flour can be bleached with such minute amounts of nitrogen peroxid "that it is difficult to detect any effect on the flour other than the bleaching and the presence of traces of nitrites. The extreme sensitiveness of the coloring matter to nitrous acid suggests that the color may be dependent on the presence of an amino group."

The effects on the human system of Louisiana manufactured sirups and molasses, R. E. Blouin, P. E. Archinard, and J. A. Hall, Jr. (*Louisiana Stas. Bul. 94, pp. 46*).—In the manufacture of Louisiana cane sirups and molasses the juice is treated with lime and sulphur fumes, and a series of investigations was undertaken to study the effects of sulphites on the human system.

Twelve negroes served as subjects of the tests, which covered 5 periods of 1 week each. In the first and fifth period a normal mixed diet without the sirup was followed and in the remaining periods sirup or molasses, which contained from 161 mg. to 928 mg. of sulphur as sulphites per kilogram was added to the ration, the amount of molasses or sirup eaten per day averaging 120 to 421 gm. per man. The subjects were not aware of the nature of the experiment.

Throughout the test examinations were made of the blood of the subjects and records were kept regarding their physical condition, body weight, etc. Among the conclusions drawn were the following:

"From a practical standpoint the experiments on molasses feeding were carried on for a sufficient length of time and on a scale large enough to test the effects of these foods on the human subject in ordinary health. . . .

"As in none of our cases were the body functions interfered with, in each one the body weight increased, and as the blood steadily increased in number of red blood cells, in the percentage of hemoglobin, etc., it must be admitted that these subjects were gaining in health and neither doing nor taking anything prejudicial to their physical well-being.

"The amount of molasses consumed, although in some instances very large, does not seem to have had any deleterious effects on the functions, weight, and blood condition of the subjects, but rather to the contrary.

"We are, therefore, free to conclude that molasses feeding, even when said molasses contains as high as over 900 mg. per kilo of sulphur as sulphites, can be carried on under ordinary circumstances without prejudicial effect to health."

The molasses and sirup used were analyzed.

General results of investigations on the effects of salicylic acid and salicylates on health, H. W. Wiley (*Chem. Ztg., 31 (1907), No. 23, pp. 301, 302*).—The data summarized have been noted from another publication (E. S. R., 18, p. 462.)

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 74, pp. 3; 75, pp. 2; 76, pp. 13*).—These publications include, respectively, the decisions which have been rendered under the provision of the pure food law regarding certificates for imported meats and meat-food products of cattle, sheep, swine, and goats; the labeling of mixtures of cane and maple sirups; and dyes, chemicals, and preservatives in foods.

Adulteration of food (*Rpt. Inland Rev. Canada, 1906, pt. 3, pp. 375*).—A summary of data showing the scope and extent of the year's work of the Canadian Inland Revenue Department in respect to food and food adulteration. The results have appeared in detail in Bulletins 106 to 124 of the department, which are reprinted as appendixes. These bulletins have been noted from time to time as they appeared.

Law with respect to foods in Germany, G. LEBBIN and G. BAUM (*Deutsches Nahrungsmittelrecht. Berlin: J. Guttentag, 1907, vols. 1, pp. 555; 2, pp. 224; rev. in Chem. Ztg., 31 (1907), No. 28, p. 361*).—This work is designed for the use of students, physicians, chemists, and manufacturers. The first volume is concerned with fines, duties, and other legal questions, while the second contains a summary of data on analytical methods with special reference to the needs of legal chemists.

Observations on human chyle, T. SOLLMANN (*Amer. Jour. Physiol., 17 (1907), No. 5, pp. 487–491*).—The chyle was obtained from a subject who had been wounded in the thoracic duct and operated on in such a way that the lymph flowed from the wound in a continuous stream for several days. When the subject fasted the chyle was clear; at other times it was more or less creamy in appearance and when creamy would clot or jelly on standing. Analyses of the chyle are reported as well as data upon the excretion of different drugs in chyle and related topics.

Do eggs affect the excretion of uric acid? P. FAUVEL (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 14, pp. 730–732*).—In the experiment reported 150 gm. egg per day was added to an otherwise purin-free diet, this period being preceded and followed by a similar diet without eggs. As shown by the data recorded, eggs did not increase the uric-acid output or the excretion of xanthouric bodies.

Total metabolism of iron and calcium in man, H. C. SHERMAN (*Proc. Soc. Expt. Biol. and Med., 4 (1906), No. 2, pp. 21, 22; abs. in Chem. Abs., 1 (1907), No. 5, p. 582*).—The balance of income and outgo of iron and calcium was determined in 3-day experiments with man. "On a diet with 0.0057 iron and 2.65 calcium oxid there was equilibrium with respect to iron and retention of calcium. With 0.0065 iron and 0.14 lime, or 0.0071 iron and 0.13 calcium oxid, there were losses of both iron and calcium." The results confirm the statement previously made that a deficiency of calcium in the diet may lead to a simultaneous loss of iron.

Thermodynamics of muscles, K. BÜRKER (*München. Med. Wchnschr., 54 (1907), No. 2, pp. 59–62; abs. in Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 2 (1907), No. 6, p. 222*).—The author's experimental methods permit the study of muscle activity and show that under the different external and internal influences which different seasons bring about the muscle possesses varying quantities of energy-yielding material. It also appears from his results that in the case of raising and lowering a weight isothermic energy is involved in the lowering, though in much less degree, as well as in the raising. Other questions are also considered.

Protein cleavage and labored breathing, C. VOIT (*Ztschr. Biol., 49 (1907), No. 1, pp. 1–36*).—An extended summary and discussion of the changes in nitrogen excretion observed when breathing becomes labored, based in a large measure upon the author's own investigations.

The increased nitrogen excretion which, it is pointed out, has been practically always noted in experimental studies of the question, in the author's opinion is dependent upon the muscular exertion just as it would be in other cases of muscular activity. The cleavages due to muscular work and to dyspnœa are, therefore, of the same character. Increased nitrogen excretion under certain pathological conditions and related questions are also discussed.

ANIMAL PRODUCTION.

Commercial feeding stuffs, H. J. Wheeler et al. (*Rhode Island Sta. Bul. 119, pp. 89-107*).—The 177 samples examined under the State feeding-stuff law included animal meal and bone, cotton-seed meal and feed, new and old process linseed meal, gluten feed, brewers and distillers' grains, wheat middlings, wheat bran, mixed feed, provender, hominy meal, horse feed, dairy and stock feed, poultry feed, and miscellaneous feeds.

Most of the feeds were essentially as guaranteed. Several samples of horse feed, however, were below standard. The cotton-seed meal recently examined, according to the authors, is not of as good quality as formerly.

"This is explained by some manufacturers as being due to the wet weather the previous autumn, and to consequent injury to the cotton seed. On the other hand it is alleged, by parties who ought to know, that some of the mills are introducing more ground cotton hulls than formerly. Whatever the cause, the attention of the consumers should be called to the facts."

As regards mixed feeds, cheap guaranteed material is being sold at present, it is pointed out, which contains corn cobs, rice hulls, or other material of little or no value as feed.

"On this account many of the manufacturers of the genuine article are now branding their goods as consisting of 'pure wheat bran and middlings,' or they are guaranteeing the percentages of fat and protein which the goods contain.

"When one considers that good mixed hay, even if free from clover, contains from 6 to 7 per cent of protein, that mixed hay and clover contains from 10 to 11 per cent of protein, and that pure clover hay contains from 12 to 13 per cent of protein, one is astounded that so many feeders of stock continue to purchase the commercial feeds of low grade at the prevailing prices. So long as such conditions exist, it is the consumer's own fault if he concludes that farming does not pay."

Forage plant investigations, H. G. Knight, F. E. Hepner, and A. Nelson (*Wyoming Sta. Rpt. 1906, pp. 35-37*).—Noted from another publication (E. S. R., 18, p. 229).

Summary of recent investigations of the value of cacti as stock food, D. Griffiths and R. F. Hare (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 102, pp. 7-18, pl. 1*).—Analyses are reported of a number of samples of cactus and cactus fruits, including both the whole fruit, pulp, and seed. In the case of a number of samples of cactus forage ash analyses were also made. The following table shows the average results obtained with the different sorts of cacti:

Average composition of cactus forage.

	Spines.	Water.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Prickly pears	0.44	84.26	0.78	0.34	9.04	2.41	3.06
Cane cacti	.79	78.47	1.41	.63	12.30	3.59	3.61
Miscellaneous cacti	1.08	87.88	1.05	.41	7.22	1.76	1.67

"On account of several practical considerations the prickly pears are of much more value than either of the other 2 groups. They are more numerous in the wild state, they adapt themselves to cultivation more readily, make a more rapid growth, and are more readily propagated from cuttings, all of which are of vital importance in the economic use and handling of the crop. Practically all of the Mexican prickly pears are fed to stock to a greater or less extent, especially those growing where fodder is the most scarce, but there is only one cylindrical-jointed species (*Opuntia imbricata*) which is used to any appreciable extent. The experience of the writers has shown that *Cereus giganteus* is readily eaten by cattle when chopped up, but they know of no actual feeding having been conducted with it on any commercial scale."

As regards cactus rations the authors point out that 40 lbs. of cactus with 10 lbs. of wheat bran and 12 lbs. of corn stover would furnish nutritive material in about the proper proportion for milch cows. "If a ration is desired in which the cactus is fed with dried brewers' grain and cotton-seed meal, it could be made by feeding 60 lbs. of cactus with 14 lbs. of brewers' grain and 1 lb. of cotton-seed meal." Other rations are also suggested.

In a discussion of the food value of different parts of the plant, it is pointed out that the seeds of many varieties, particularly of the genus Opuntia, are hard and woody and to a great extent at least pass through the animals unchanged. With other cacti the seeds are very different in character.

"There is no doubt that burros, which commonly feed upon the fruits of the viznaga (*Echinocactus wislizeni*), get a deal of nourishment out of the seeds, which are very oily and easily masticated."

Other questions connected with the conditions favorable to the growth of prickly pears, the nomenclature of cacti, and related questions are discussed and some data are given regarding the use of cacti in Mexico as human food.

The digestibility of cattle foods, J. B. LINDSEY, E. B. HOLLAND, and P. H. SMITH (*Massachusetts Sta. Rpt. 1906, pp. 96–156*).—The digestibility of a number of feeding stuffs was studied with sheep, the same methods being followed as in earlier work of which this is a continuation (E. S. R., 17, p. 279). The average results obtained follow:

Coefficients of digestibility of feeding stuffs in experiments with sheep.

Kind of feed.	Number of tests.	Dry matter	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
		Per cent.	*Per cent.*	*Per cent*	*Per cent*	*Per cent.*	*Per cent.*
Soy-bean fodder	3	64.82	80.26	67.50	74.61	47.55	39.29
Malt sprouts	3	81.87	75.92	86.60	85.30	99.42	19.12
Sucrene dairy feed	2	69.48	60.79	94.41	72.54	71.94	37.72
Holstein sugar feed	3	71.31	65.65	87.83	80.50	44.07	32.97
Macon sugar feed	2	70.53	58.88	82.37	82.12	43.88	20.42
Hominy feed	2	87.58	69.54	88.16	92.61	79.96	48.88
Buckwheat middlings	3	75.04	85.13	89.36	88.27	16.92	35.56
Oat middlings	2	89.65	80.36	98.22	95.27	48.93	85.56
Eureka silage corn stover	2	54.40	48.29	66.58	52.93	59.06	45.01
Pride of the North corn stover	2	53.97	44.85	64.40	53.88	60.25	31.09
English hay	14	62.51	56.75	51.09	63.53	67.28	45.90
Early Amber sorghum	2	68.37	48.14	62.75	78.70	68.47	41.72
Pride of the North corn fodder	2	70.56	62.74	76.06	77.04	64.82	34.48
Porto Rico molasses, 150 gm	2	99.01	25.30	....	99.28	....	86.09
Porto Rico molasses, 250 gm	2	90.05	....	....	95.38	....	52.56
Porto Rico molasses, 250 gm	2	74.52	....	....	85.87	....	64.69
Gluten feed	2	95.81	91.09	77.69	95.23	126.19	88.37
Green diamond sugar feed	2	65.54	69.57	83.57	74.39	43.78	37.66
Sea Island cotton-seed meal	2	67.95	78.39	100.00	78.18	40.82	84.56
Red wheat meal	2	85.78	67.10	79.97	92.47	....	27.58
Leaming corn silage	2	70.02	68.91	84.64	72.89	71.02	49.88
White winter wheat meal	2	88.28	81.79	64.35	98.49	....	29.50
Feed barley meal	2	88.97	88.08	86.34	93.01	70.40	87.64

Some of the conclusions which were drawn follow: "The soy-bean fodder appears to be slightly less digestible than that of other legumes, due in all probability to the tough woody stems which are characteristic of the plant. Note the low digestibility of the fiber and the high digestibility of the protein."

The Sucrene dairy feed "is decidedly less digestible than either flour middlings or gluten feed, and either of the two latter feeds would furnish digestible matter and especially digestible protein for less money than the Sucrene feed." Similar conclusions were drawn for the other sugar feeds tested.

Standard hominy feed, apparently, "has fully as much digestible matter as is contained in a like quantity of an average quality of corn meal. Hominy contains rather more protein and noticeably more fat than clear corn, and for some purposes may be considered a preferable feed."

Judged by composition and digestibility, oat middlings "would be a few per cent more valuable than average wheat-flour middlings for ordinary feeding purposes. It ought to make a valuable feed for young calves.

"It is evident from the analysis, from the digestion coefficients obtained, and from the retail price of the article ($26 to $28 a ton) that genuine buckwheat middlings is an economical source of dry matter and digestible protein."

The sorghum fed as a soiling crop was found to have had the same digestibility, according to the authors, as millet and corn fodder at a similar stage of growth. "The protein only seems to be less digestible than that contained in the other two fodders. Sorghum is eaten well by dairy cattle, is available just before corn is sufficiently mature to be at its best, and is considered a satisfactory addition to the list of soiling crops for Massachusetts."

When the smaller amount of molasses, 150 gm. per head daily, was consumed with 800 gm. of hay the results were somewhat contradictory and definite conclusions can not be drawn "other than to conclude that this quantity of molasses was well assimilated, without causing any serious digestion depression." When the larger amounts of molasses, 250 gm., were consumed with a like quantity of hay or with 600 gm. hay and 200 gm. gluten feed, a depression in the digestibility of other constituents of the ration was noted and it is intended to continue the work to secure additional data. From the results as a whole it is evident that "2,000 lbs. of Porto Rico molasses contain between 1,080 and 1,160 of easily digestible carbohydrates, and that its crude protein has little or no value as a source of nutrition.

"The gluten feed appears to have been thoroughly digested, showing higher coefficients than the average of previous trials."

It is claimed that the hulls of Sea Island cotton seed are thin and that it is not possible or profitable to thoroughly separate them from the meats. In general, the Sea Island cotton-seed meal was inferior in digestibility to high-grade meal.

"The fat in the low-grade meal is shown to be nearly all available, while the protein is somewhat less digestible than that contained in a high-grade meal; the chief difference, however, in the digestibility of the 2 grades is to be found in the total dry and extract matter, decidedly lower coefficients being secured from the low-grade meal containing a high fiber percentage. . . . The low-grade meal contains only about one-half as much of the most valuable ingredient (digestible protein) as does the high-grade meal. The former meal will likewise require considerably more energy for its digestion."

In the authors' opinion, the observed increased digestibility of protein of white wheat and feed barley over red wheat protein is probably due to the relatively higher protein contents of these two grains and consequently of the rations containing them. "It is believed that the protein in ordinary grains (maize, wheat, and barley) is equally and quite fully digested, providing it is fed in a ration having a ratio of 1:8 or less.

"In view of their composition and digestibility, it would seem as if there were no reason to expect any particular difference in the feeding effect of . . . wheat and corn. It is possible, however, that the energy required for the digestion of the wheat might be greater than that required to digest the corn. It is well known that poultry are particularly fond of corn and moderately so of wheat, but do not care especially for barley. This fact should not be overlooked in comparing the relative merits of corn, wheat, and barley for this class of stock."

The data for Blomo horse feed, which are reported, have been noted in a previous publication (E. S. R., 17, p. 283). The materials used in the digestion experiments were analyzed.

Digestion experiments with wethers, H. G. KNIGHT, F. E. HEPNER, and G. E. MORTON (*Wyoming Sta. Rpt. 1906, pp. 38–44*).—Noted from another publication (E. S. R., 18, p. 262).

Ration experiments with lambs, 1905–6, G. E. MORTON (*Wyoming Sta. Bul. 73, pp. 18, figs. 12*).—In the first of the feeding tests reported native hay fed with oats, corn, and barley meal, alone and supplemented with oil meal, was compared with alfalfa hay and corn, using 7 lots of 5 lambs each. In the 14 weeks covered by the test the gain on the native hay rations ranged from 12.8 lbs. per head when corn was fed to 17.4 lbs. with oats and oil meal. The smallest amount of grain per pound of gain, 5.75 lbs., was noted with the barley ration and the largest amount, 6.77 lbs., with the oats and oil meal ration, 6.54 and 5.74 lbs., respectively, of the hay being required in addition. In the case of the alfalfa hay ration 3.82 lbs. of corn and 5.84 lbs. of hay were required per pound of gain.

"None of the native hay rations were as satisfactory as corn and alfalfa.

"Hulled barley and native hay proved to be the most economical of the native hay rations.

"Oil meal, fed with native hay and grain, increases the cost of gain, although it produces slightly greater gains than native hay and grain without oil meal. When fed with corn and native hay, it produces enough greater gains to make the ration practically equal in cost to the native hay and corn ration, and the extra degree of fatness in the lambs brings a better price in the market."

In a comparison of corn and alfalfa hay with peas in the field, which was made with 2 lots of 100 lambs each, the average gain per head on the former ration was 31.24 lbs. in 14 weeks and on the latter 19.98 lbs., 6.82 lbs. of alfalfa and 2.92 lbs. of corn being required per pound of gain, as compared with the peas grown on five-eighths of an acre.

"Field peas, grazed off, showed returns approximately equaling the returns from feeding alfalfa and corn, with the peas valued at $8 per acre, alfalfa at $5 per ton, and corn at $1 per cwt.; although the alfalfa and corn lambs gained about one-half more than the pea lambs."

During shipment the lambs fed corn and alfalfa shrank 4.2 lbs. per head more than the pea-fed lambs.

Summary of lamb feeding, 1905–6, G. E. MORTON (*Wyoming Sta. Rpt. 1906, pp. 23–32*).—Noted above from another publication.

Growing hogs in western Nebraska, W. P. SNYDER (*Nebraska Sta. Bul. 99, pp. 32, figs. 9*).—A number of tests were undertaken to ascertain the most profitable methods of producing pork on alfalfa and to study the feeding value of grains commonly grown locally.

Using 10 lots of 12 to 30 pigs, 3 tests were made to compare varying amounts of grain (corn alone or with rye or shorts) as a supplement for alfalfa pasturage. The feeding periods varied from 63 to 119 days in length. The average daily gain ranged from 0.28 lb. on 0.5 lb. of corn per 100 lbs. live weight to 1.08 lbs. per head per day on a full ration of corn with rye during the latter part of the period. The greatest range in grain eaten per pound of gain, 1.21 to 3.36 lbs., and in average daily profit per pig, 1.3 to 3.6 cts., respectively, were also noted with these lots.

The relative merits of long and short feeding were tested by continuing one of the lots on the light grain ration (3 lbs. per 100 lbs. live weight) until the whole period covered 259 days. The average daily gain was 0.68 lb., the grain eaten per pound of gain 3.88 lbs., and the daily profit per pig 2.5 cts.

"A light grain ration is not the most economical for growing pigs, unless under peculiar circumstances, when alfalfa is abundant, grain very high in price, and market conditions warrant holding the hogs. It seems probable that 2 or more pounds of corn daily per each hundredweight of hogs is more profitable than a lighter ration.

"The cost of gain is not a reliable criterion of profit. A cheap gain may be so slow as to be unprofitable. Time, labor, and investment should be considered when reckoning profits. A full grain ration, though making the gain more costly, usually gives greater profits, because of the larger amount of business transacted in a given time with a given number of hogs."

Four tests covering 30 to 95 days were made with 7 lots of 10 to 29 pigs each to study different methods of feeding corn with alfalfa pasturage. On the alfalfa alone the average daily gain was 0.49 lb. per head and on corn alone in a dry feed lot 2.55 lbs., 4.31 lbs. of grain being required per pound of gain and the daily profit per pig being 7 cts. On corn and pasturage combined the greatest gain, 2.83 lbs. per head per day, was noted with one of the lots fed 3 lbs. of corn per 100 lbs. live weight, the grain eaten per pound of gain being 3.01 lbs. and the daily profit per pig 10 cts. A lot on the same kind of ration and one on a full corn ration with alfalfa each made an average daily gain of 1.6 lbs. per head.

"Mature hogs thin in flesh may be expected to gain about ½ lb. per head daily on alfalfa without grain.

"Mature hogs, fed corn in a dry lot while being fattened, required nearly one-half more grain to produce 100 lbs. gain, and gave a daily profit of 3 cts. less per hog than similar hogs running on alfalfa pasture."

When wet ground corn and barley were fed alone, with whole alfalfa hay, and mixed with cut alfalfa hay in a 91-day test with 6 lots of 10 pigs each, the smallest gain, 1.07 lbs. per pig per day, was noted with barley and cut alfalfa 3:1, and the largest gains, 1.26 lbs. and 1.27 lbs., with corn and cut alfalfa 3:1 and corn and alfalfa hay, respectively. The grain eaten per pound of gain ranged from 4.2 lbs. on the corn and cut alfalfa ration to 5.73 lbs. on barley alone, and the daily profit per pig from 2.2 cts. on the last-mentioned ration to 3.6 cts. on the corn and cut alfalfa 3:1.

In a comparison of corn, emmer, and barley with alfalfa hay, which was made with 3 lots of 20 pigs and covered 94 days, the average daily gains on the 3 grains were 1.02, 0.77, and 0.81 lbs. per head, respectively. With corn alone and with emmer and with barley 1:1, the average daily gains were 1.53, 1.35, and 1.45 lbs., respectively. Each lot contained 12 pigs and the test covered 42 days. Considering both the tests the grain eaten per pound of gain ranged from 4.62 lbs. with corn and barley to 6.18 lbs. with emmer, and the daily profit per pig from 1.3 cts. on emmer to 3.9 cts. in one of the tests on corn alone.

"For fattening hogs that have access to alfalfa hay, corn at 35 cts., barley 24 cts., and emmer 19 cts. should give about equal profits. Under these conditions, 4 bu. of barley are worth as much as 5 bu. of emmer.

"Where barley or emmer is fed to hogs it is more profitable to make the ration one-half corn than to feed emmer or barley alone."

Considering financial aspects the conclusion is drawn from the tests as a whole, that "conditions in western Nebraska are favorable to a large production of pork. In every test, where conditions were not peculiarly unfavorable, grain fed to hogs has returned much above the market price.

"Alfalfa may be fed with profit to growing or fattening pigs in almost any form so long as it does not make up too large a proportion of the ration. When cut and fed as one-quarter of the ration with ground corn, it materially reduced the cost of gains and increased the profits. . . .

"With sufficient good alfalfa, well stacked, mature hogs can be carried through the winter in fair condition, with 3 lbs. of corn per head per day, and if necessary with much less grain."

The damage done by the hogs to the alfalfa pastures is estimated by the author at one-half the crop or less.

"The number of hogs that may be pastured profitably on an acre depends very largely on the amount of grain fed. Probably from 6 to 8 hogs, under ordinary conditions, would be about the right number. This would allow enough alfalfa to grow to make 3 fair crops per year. The fields should be small rather than large, so that the part nearest the water and sheds will not be kept too close to the ground and that at the farther end of the field be left untouched.

"We have not observed satisfactory results with sows run on alfalfa without grain during the pregnant period, although very little grain is necessary for pregnant sows which are to farrow in the fall."

Poultry experiments, 1906–7, G. M. GOWELL (*Maine Sta. Bul. 144, pp. 145–186, pls. 6*).—The construction and operation of the station brooder houses, houses for laying and breeding hens, and trap nests are discussed, as well as the station methods of feeding young chickens, cockerels, growing pullets, and hens.

In the case of pullets it is stated that the method of dry feeding described in an earlier publication (E. S. R., 17, p. 388) has given satisfactory results.

"The labor of feeding is far less than that required by any other method. The birds do not hang around the troughs and overeat, but help themselves, a little at a time, and range off, hunting, or playing and come back again, when so inclined, to the food supply at the troughs. There is no rushing or crowding about the attendant, as is usual at feeding time, where large numbers are kept together."

In the case of hens the average amount eaten per bird during the last year approximated 90 lbs. grain and meal mixture, 4 lbs. oyster shells, 2.4 lbs. dry cracked bone, 2 lbs. grit, 2.4 lbs. charcoal, and 10 lbs. clover. The cost of these materials was about $1.45 and the average egg production 144 per hen.

The relative value of green alfalfa and clover was studied, a peck of the finely chopped material per 100 hens being fed twice a day. The hens "evidently relished the clover better than the alfalfa, but the alfalfa has the advantage of being ready to use before the clover has made growth enough to cut. . . .

"Clover is the most satisfactory green food that the station has used and the expense of growing it need not be great, as small areas will furnish enough for liberal feeding. The supplies of it should be constant, and that there may be no shortage between the first and second crops in the regular clover fields, small tracts of land can be seeded on the frozen ground early in the spring and the clover be large enough for use when needed to keep good the supply.

"Dwarf Essex rape has also been satisfactorily used for green food for growing chickens in the open field. . . .

"Experience with the wide, open front house is in favor of yards on the north rather than on the south side of the building."

When dry oat hay was used instead of oat straw for bedding it was found that the hens ate considerable quantities of the material, which was decidedly laxative.

"Long ago we learned that we must not feed mangles too freely, because of their laxative tendencies, but there was no thought that the dry hay, although made from young plants, was comparable with the crisp, juicy mangles."

A test of the relative merits of like amounts of whole and cracked corn as part of the ration was made with 10 lots of 100 birds each. The corn was mixed with wheat 1 : 1 and was fed scattered evenly over the floor. On the whole corn ration the average egg production in 6 months was 77.8 eggs per hen and on the cracked corn ration 75.9 eggs. Nineteen of the hens fed whole corn and 29 of those fed cracked corn died during the test.

"There is nothing in the results that leads to the conclusion that it is necessary or advisable to crack the corn fed to hens kept for laying eggs. The slight differences in the average yields of the birds in the 2 classes should not be interpreted as meaning that cracked corn is inferior to whole corn. Neither do the somewhat greater losses of birds on the cracked corn ration indicate that the cracked corn was injurious."

Unsatisfactory results were noted when hens were kept in winter in houses sprayed with lice exterminator. The egg yield was materially diminished and the hens were in poor condition for some time. The author believes that such preparations should not be used too freely in cold weather.

"The most unsatisfactory feature of this experience was that the treatment did not kill the lice or materially lessen their numbers. It was only when, later, the birds were individually treated with the tobacco dust and insect powder, worked in among the feathers, that the lice were nearly exterminated.

"The insides of the buildings are treated with these liquid preparations in warm weather, so that the woodwork may be obnoxious to the lice and prevent their lodging there. For this purpose they are satisfactory, but our experience with them shows plainly that any material, with odors sufficiently strong to penetrate the feathers and kill the lice on the bodies of live hens, will prove destructive to the hens themselves."

Poultry experiments, W. P. BROOKS, E. S. FULTON, and E. F. GASKILL (*Massachusetts Sta. Rpt. 1906, pp. 60–64*).—Continuing earlier work (E. S. R., 18, p. 268), wheat and corn supplemented by animal meal were compared, both rations having a high content of fat and ash and a low crude fiber content. The deficiency in fat in the wheat ration was made up by adding corn oil. On the wheat ration with a nutritive ratio of 1 : 4.57 the egg production for the first period, January 25 to April 28, was at the rate of 48 eggs per day per 100 hens, and on the corn ration with a nutritive ratio of 1 : 6.5, at the rate of 54 eggs per day, the cost of feed per egg being 0.96 ct. and 0.73 ct., respectively. For the second period, April 28 to September 5, the wheat ration produced at the rate of 37 eggs per day per 100 hens and the corn ration 39 eggs, the cost of feed per egg being respectively 1.01 and 0.82 cts. The results are in accord with those previously obtained.

When wheat and corn were compared in similar rations except that milk albumen was the animal feed used, the average egg production on the wheat ration during the winter period was at the rate of 49 eggs per day per 100 hens and during the summer period 35 eggs, and on the corn ration during the two periods 47 and 46 eggs, respectively. On wheat the cost of egg production in both periods has been 0.96 ct. per egg and on the corn ration 0.86 ct. in the winter period and 0.74 ct. in the summer period. In general, the results support the conclusions previously drawn.

In the third test, oats and oat feed, grains with high crude fiber content, were compared with rice, in which this constituent is low, the rations as a whole having low protein, high ash, and high fat content. During the winter period the egg production on oats was at the rate of 32 eggs per day per 100 hens and on rice 46 eggs, and during the summer period on the oat ration 32 eggs and on the rice ration 37 eggs. The authors state that the cost of the feed eaten per egg produced was greater on the rice than on the oat ration. The results obtained are in accord with those of previous years, namely, that a large proportion of crude fiber in a ration for laying fowls seems to be very unfavorable to satisfactory egg production..

Range management, J. S. Cotton (*U. S. Dept. Agr. Yearbook 1906, pp. 225–238, pl. 1*).—The present condition of the western ranges and the need for avoiding overgrazing, resting the land, alternation of pastures, reseeding ranges, conservation of water, and other methods of range improvement are discussed, as well as the need for improving the grade of stock and similar topics.

In order to secure the greatest returns from land, it will be necessary in the future, in the author's opinion, to raise feed for wintering cattle.

"Of the different cereals that can be used for hay, rye will probably prove to be the surest to yield a good crop over the greatest area of country. . . . Beardless barley is another excellent crop to grow for grain hay. . . . In some sections of the country, as in the Dakotas, durum wheat will produce a considerable amount of forage in the more favorable years. In other sections many of the farmers seem to be well pleased with spelt. These last two plants are not so desirable for stock as some others on account of their heavy beards."

There is a noticeable movement toward farming range lands.

"Present tendencies indicate that the range-stock industry of the future will be confined to those regions that are too rough for cultivation or too arid for the successful growth of crops. Except in the high mountain regions, where the grazing season is very short, or in the desert areas, where, on account of the scarcity of water, grazing can be carried on only during the winter months, the grazing will eventually be carried on in inclosed fields or on definitely assigned tracts. The stockmen will endeavor to get bodies of land large enough to support their stock, either by purchase, leasing, or, in case the homestead act should be amended to fit range conditions, by homesteading. Many living in close proximity to forest reserves will secure grazing permits, allowing them to run stock in these areas during the summer season. Wherever possible these men will raise enough feed to carry their stock safely through the winter season."

Foreign restrictions on American meat, F. R. Rutter (*U. S. Dept. Agr. Yearbook 1906, pp. 247–264, fig. 1*).—The author has summarized the laws and regulations in force in the principal foreign countries regarding the importation of American meat and meat products and similar data, believing that a knowledge of present conditions is necessary if trade is to be extended.

"There is no reason why the stricter control now exercised [in the United States] over all processes of slaughtering and preparation of meat should not induce the leading foreign governments to modify the more serious restrictions and admit American meat on freer terms. Such action is more feasible because treaty relations among European countries are still undergoing revision, and within many of those countries a strong demand has sprung up for the freer admission of foreign cattle and meat."

Some recent studies on heredity, E. B. Wilson (*Jour. Amer. Med. Assoc., 48 (1907), No. 19, pp. 1557–1563*).—This discussion of recent experiments in the study of heredity is of interest in connection with animal breeding.

Classification for American carriage horses (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 113, pp. 4*).—The Bureau of Animal Industry, in cooperation with experiment station officials, is attempting to establish a breed of American carriage horses which will come true to type. In order to accomplish this result it was thought desirable to establish also classes for such horses at State and National fairs. The present classification was adopted and is recommended to fair associations in order to make the qualifications for carriage horses at different fairs as nearly uniform as possible.

Relative proportions of the sexes in litters of pigs, G. M. Rommel (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 112, folio*).—From data gathered for 1,477 sows representing 8 breeds, it appeared that the average size of a litter was 9 pigs in round numbers, made up of boars and sows in about equal proportion, the ratio being 201 of the former to 200 of the latter.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Dairy farming, J. Michaels (*Clemson College, S. C.: Author, 1907, pp. 212, figs. 67*).—The author states in his preface that he has endeavored to arrange in a concise and systematic form the essential facts relating to the science and practice of dairy farming. The book consists of two parts, one dealing with the dairy herd and the other with milk and its products. It is written in plain language so that it may be used by the farmer not versed in science as well as by the dairy student. The technical terms used are defined.

Opportunities for dairying (*U. S. Dept. Agr. Yearbook 1906, pp. 405–428*).—Following brief general notes by W. H. Dexter, G. M. Whitaker discusses dairying in New England, B. D. White dairying in the North Central States, B. H. Rawl dairying in the South, and E. A. McDonald dairying on the Pacific coast. The advantages and disadvantages of the industry in each of the regions mentioned are clearly set forth.

The dairy cow, P. Dechambre (*La Vache Laitière. Paris: Libr. Sci. Agr., 1907, pp. XI+280, figs. 23*).—This volume is a part of a series on agriculture and agricultural science. It deals with the formation of milk, the various dairy breeds, the care and feeding of cows, milking, and some of the more common diseases of cows.

The production, care, and uses of milk (*Ontario Dept. Agr. Bul. 160, pp. 16*).—This bulletin is made up of a number of brief popular articles on subjects indicated by the title.

Development of dairy shorthorns, R. T. Archer (*Jour. Dept. Agr. Victoria, 5 (1907), No. 6, pp. 348–357, figs. 6*).—Notes are given on the value of shorthorns for dairy purposes and records of 40 cows for 1 to 6 lactation periods are reported. The average yield of 13 3-year-old heifers for 1 year was 583 gallons of milk and 289.9 lbs. of butter.

Record of the station herd, 1905–6, J. L. Hills (*Vermont Sta. Rpt. 1906, pp. 351–355*).—Tabulated records of the station herd from November 1, 1905, to October 1, 1906, are published.

The effect of age on the yield and quality of milk, J. L. Hills and E. Kibby (*Vermont Sta. Rpt. 1906, pp. 339–350*).—Annual records of 99 cows secured at the station during a period of 10 years were studied to show what effect advancing age has upon the yield and quality of the milk. The principal conclusions reached are summarized as follows:

"*Milk flow.*—At the outset and until the average cow was 7 years old the general tendency was for the flow to increase in volume. That of her eighth year tended to be lower than that of the seventh, much lower than that of the ninth, and to resemble that of the tenth year. No cause was found nor is stress laid upon the sag. From the ninth year the trend was downwards.

"*Total solids.*—In 3 cases in 46 the trend from the first figure to those following is upwards; in 10 cases the change is nil; in 32 cases the trend is downwards.

"*Fat.*—In 3 cases in 46 the trend from the first figure to those following is upwards; in 14 cases the change is nil; in 29 cases the trend is downwards.

"*Solids-not-fat.*—In 9 cases in 46 the trend from the first figure to those following is upwards; in 14 cases the change is nil; in 23 cases the trend is downwards."

Similar studies made elsewhere are summarized. The differences from one year to another were not striking. The author does not believe that the effect of advancing years upon milk quality is profound enough to be of importance until old age becomes imminent.

Home-grown protein v. purchased protein; distillers' grains v. gluten feed; summer silage v. soiling, G. A. Billings (*New Jersey Stas. Bul. 204, pp. 28*).—Three feeding experiments are reported.

In the first experiment alfalfa hay was compared with purchased feeds as a source of protein. Two lots of 4 cows each were fed for 2 periods of 60 days each. When alfalfa hay was the sole source of protein the average daily yield of milk per cow was 20.41 lbs. and the yield of fat 0.876 lb. The cost to produce 100 lbs. of milk was 94.36 cts. and the cost of 1 lb. of butter 18.82 cts. When protein was supplied by distillers' grains, wheat bran, and cotton-seed meal the average daily yield was 24.63 lbs. of milk and 1.068 lbs. of fat. The cost to produce 100 lbs. of milk and 1 lb. of butter was respectively 83.72 and 16.55 cts. The conclusion is drawn from the results of this experiment that alfalfa and other home-grown protein feeds may well furnish a large part but not the whole of the protein required to balance rations in which silage or other roughage of like character is used.

In the second experiment including 4 cows and lasting 60 days, dried distillers' grains were compared with gluten feed in quantities making the nutritive ratios practically the same. Of the gluten feed ration the average daily yield per cow was 23.31 lbs. of milk and 0.994 lb. of fat. The cost of production per 100 lbs. of milk was 86.40 cts. and of 1 lb. of butter 17.36 cts. When distillers' grains were fed the average daily yield was 23.85 lbs. of milk and 1.026 lbs. of fat. The cost of producing 100 lbs. of milk was 80.50 cts. and of 1 lb. of butter 16.04 cts.

Summer silage was compared with soiling, the experiment including the herd of 25 cows and the feeding periods being 3 weeks for each ration. The average daily yields of milk per cow on wheat forage and corn silage were, respectively, 22.35 and 21.71 lbs., the average yields of fat 0.953 and 0.929 lb., the cost of producing 100 lbs. of milk 74.72 and 74.80 cts., and the cost of producing 1 lb. of butter 15.01 and 14.99 cts. The shrinkage on the silage following the forage was, therefore, about 3 per cent, which was less than the average shrinkage for the herd at the same season in previous years. The silage ration, therefore, more than maintained the yield of milk obtained with the forage crop ration.

Feeding trials with cows, J. L. HILLS (*Vermont Sta. Rpt. 1906, pp. 302–336, 356–384*).—The feeding trials conducted during the year were made with 44 cows, lasted 25 weeks, and included tests of silage made from frosted and from frozen corn, tests of alfalfa hay meal, and a further study of the experimental error involved in feeding trials by the alternation method.

The work is summarized as follows:

"Silages made from mature frosted and from mature frozen corn, compared with those made from immature unfrosted and frosted corns, contained from 6 to 15 per cent more dry matter. The effect of frost was slightly to depress the total solid and fat yields of milk, not to exceed 3 per cent, however, in any case. The milk yields were but slightly changed, with a tendency to depression. This minor loss is a negligible quantity as compared with the increased growth of digestible dry matter arising from the greater maturation of the crop. No ill effect was observed on the butter, although no special trial of the matter was made. Silage from frozen corn is said to keep well in a silo. The testimony of these considerable and varied trials would seem to warrant one in advising that frost risks be run in order to gain a greater maturation, when the corn has not reached a desired stage of ripening at the normal time of harvest, provided the crop is to be ensiled.

"An alfalfa meal ration made less milk and butter, carried less fertilizing value, and was fed at a loss, as compared with a wheat bran ration, the meal costing $27 and the wheat bran $18.50. Had each cost alike the former would still have been outclassed. An alfalfa meal ration made one-seventh less milk, one-sixth less butter, and the ration containing it carried one-sixth less plant food value than did one containing distillers' dried grains. It is utterly outclassed at equal prices.

"Protena, a proprietary article, the basis and principal constituent of which is alfalfa meal, made as much milk as did a mixture of wheat bran, cotton-seed and linseed meals, but 7 per cent less butter. The Protena ration carried but four-fifths the plant food content of its competitor, and was outclassed when financially compared.

"It does not seem that alfalfa products can be considered economic feeds at present, unless sold at $18 or less.

"Experimental error, when the alternation system is properly employed, is a negligible quantity."

Prickly pear and sotol as winter forage (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 6, pp. 18*).—The results of feeding experiments with 15 cows indicated that under Mexican conditions satisfactory use may be made of species of Opuntia and of *Dasylirion wheeleri* for feeding cows during the winter months.

Cotton-seed meal and corn silage as a ration for dairy cows, J. MICHELS and J. M. BURGESS (*South Carolina Sta. Bul. 131, pp. 11*).—Ten cows were fed a ration consisting exclusively of cotton-seed meal and a good quality of corn silage for a period of over 5 months with very satisfactory results. The cows yielded more milk and butter fat than during any corresponding period in previous years. No bad effects were observed even when the meal and silage were fed separately. It is, therefore, believed that cotton-seed meal to the extent of 5 to 6 lbs. per cow daily and well-matured corn silage constitute an excellent ration for milch cows. The good results obtained by the authors in feeding cotton-seed meal and silage are attributed in a large measure to the fact that the silage was made from well-matured, well-eared corn.

Milking machines, H. H. DEAN and S. F. EDWARDS (*Ontario Dept. Agr. Bul. 159, pp. 24*).—The first part of this bulletin, by Professor Dean, gives the results of considerable experience with milking machines, from which the author draws the following conclusions:

"In the comparative tests made of hand and machine milking for short periods the results were in favor of hand milking in all tests except one.

"When the machine was compared with inexperienced hand milking there was not so much difference between the results got from hand and machine milking, showing that under certain circumstances the machine might be equal to hand milking for at least a short period of time.

"The general tendency was for the cows to go dry sooner than they were accustomed to do with hand milking. This was more particularly the case with the older cows. However, this is a point not easily solved, as cows vary in this respect from year to year.

"Some of our young cows have given very good results with the machine, indicating that it may be possible to breed and train cows which will give fairly good results under this system of milking, though they are not likely to be so good as if trained to hand milking.

"Special care needs to be exercised in the cleaning of the machine, otherwise the milk is liable to be tainted. Simply sucking water through the parts is not sufficient. All parts of the machine that come in contact with the milk must be thoroughly scalded or steamed, at least once a week, and for good results this should be done daily.

"On average farms, where 10 to 25 cows are kept, we do not believe that it would pay to install a milking machine at present. On farms where 50 to 100 or more cows are kept, and where labor is very expensive and difficult to get, and where the owner of the cows is not so particular about maximum yields from individual cows, the milking machine is worthy of careful consideration. However, we do not consider the machines at present on the market as anywhere near perfection, and we look for great improvement in them during the next few years."

The second part, by Professor Edwards, gives the results of bacteriological tests of machine-drawn and hand-drawn milk. When strict sanitary precautions were observed, milk obtained in the 2 ways showed practically the same average bacterial content.

The effect of freezing milk on creaming and churning and upon the quality of the butter, J. L. HILLS and E. L. KIRBY (*Vermont Sta. Rpt. 1906, pp. 337–339*).—In experimental work at the station the skimming of milk was not affected by freezing when the milk was properly warmed before running through the separator. The ripening of cream and the completeness of churning were also unaffected by freezing. A slight difference in the quality of butter made from frozen and normal milk was considered almost negligible.

Report of Swedish butter exhibits, 1906 (*Meddel. K. Landtbr. Styr. [Sweden], 1907, No. 1 (120), pp. 1–37*).—The report contains the usual information as to the examinations and scorings of Swedish export butter, conducted by a committee of the Swedish agricultural department during 1906.

During the year, 552 different creameries took part in the exhibits, the total number of tubs of butter scored being 2,230. These were in nearly all cases examined for water content, refractive index, and volatile fatty acids in the butter fat. The percentage of water in the butter ranged between 9.4 and 19 per cent for the individual tubs, and between 11.6 and 16.6 per cent, an average of 13.5 per cent, for the different creameries. The refractive index of the butter fat varied from 48.2 to 54.3, about 90 per cent falling between 50 and 53. The Reichert number ranged between 26.6 in the summer and 32.6 in the winter, with averages of 30.1 cc. for the summer, 30.5 for the fall, and 30.9 for the winter series. About 90 per cent of the creameries pasteurized their milk or cream. Pure cultures were used exclusively by 55 per cent of the creameries, at times by 18 per cent, while 22 per cent used buttermilk starter, and about 8 per cent made sweet-cream butter.—F. W. WOLL.

Essentials of milk hygiene, C. O. JENSEN, trans. and amplified by L. PEARSON (*Philadelphia: J. B. Lippincott Co., 1907, pp. 275, figs. 24*).—This book has been well translated and much improved by the additions made by the translator. It covers quite fully the whole subject of the sanitary supervision of the production, handling, and sale of milk and has been well adapted to American conditions.

Preservation of cow's milk, E. VON BEHRING (*Behringswerk Mitt., 1907, No. 2, pp. 25–38*).—A mixture of formaldehyde and hydrogen peroxid is considered by the author the best preservative of milk intended for human consumption. The article contains a few artificial digestion experiments with heated milk, but is mainly an argument in favor of the use of formaldehyde in milk under certain conditions.

A plan for improving the quality of milk and cream furnished to New Hampshire creameries, I. C. WELD (*New Hampshire Sta. Bul. 132, pp. 59–67, figs. 6*).—The author advocates the grading of cream and the paying of patrons accordingly. Such a system was put into operation at the New Hampshire College creamery July 1, 1906. The points allowed for a perfect score were as follows: Flavor 50, acidity 25, and condition 25. The scores for the milk of 25 patrons ranged from 77 to 95.

The bulletin contains a description of the apparatus and methods employed in determining the quality of milk and cream.

"The system of scoring or grading milk or cream and grading the price paid creamery patrons for butter fat according to the quality or condition of the milk or cream from which that fat is obtained would seem to be eminently just to the producer as well as to the creamery. While a part of the work of grading can be done by the use of tests which give results directly expressed by figures, other parts of the work are dependent solely upon the good judgment, ability, and honesty of the person who has the work in charge."

The Copenhagen milk supply company (*La Société Laitière d'Approvisionnement de Copenhague. Copenhagen, 1906, pp. 47, pls. 3*).—This is an authoritative account of the organization and work of the Copenhagen milk supply company, published on the occasion of the International Exposition at Milan in 1906.—F. W. WOLL.

Milk supply of Copenhagen, HOLLMAN (*Molk. Ztg., 21 (1907), No. 27, pp. 749–752*).—This article contains considerable statistical, chemical, and bacteriological data concerning the milk supply of Copenhagen.

Hemolytic substances in milk, M. PFAUNDLER and E. MORO (*Ztschr. Expt. Path. u. Ther., 4 (1907), No. 2, pp. 451–469*).—Intermediary bodies capable of producing hemolysis were not found in the several kinds of milk examined. Hemolytic complements, however, were found in the milk of the cow, goat, and guinea pig.

Variations in the chemical composition of the milk of tuberculous cows with and without mammary lesions, MOUSSU and MONVOISIN (*Compt. Rend. Soc. Biol. [Paris], 43 (1907), No. 26, pp. 156–158*).—The milk of cows affected with tuberculosis showed a diminution in acidity varying in proportion to the extent of the mammary lesions. In cases showing no mammary lesions the acidity was 0.08 per cent. With advanced lesions in the udder the acidity was still further reduced, being as low as 0.012 per cent. This variation in acidity from a normal of 0.14 to 0.20 per cent is directly opposite to that found in ordinary mammitis.

The total nitrogen was increased, the amount being sometimes double that in normal milk.

The fat showed a progressive diminution and became as low even as 0.15 per cent. The sugar was likewise reduced and occasionally was entirely absent.

The authors observed a lowering in the index of refraction, but no change in the freezing point, the latter being attributed to an increase in the amount of sodium chlorid.

The bacteriolytic alexin of milk, E. Moro (*Ztschr. Expt. Path. u. Ther., 4 (1907), No. 2, pp. 470–479*).—In experiments with the typhoid bacillus, raw cow's milk showed bactericidal properties. This was not true of the filtrate from the milk. Heating the milk for ½ hour at 56° C. destroyed its bactericidal properties. Milk freed from leucocytes by centrifuging still possessed an unfavorable influence upon the growth of the typhoid bacillus. Similar results were obtained with human milk.

Concerning the identity of the casein of different species of animals, R. Burow (*Beiträge zur Entscheidung der Frage, ob die Caseine verschiedener Tierarten identisch sind. Inaug. Diss., Univ. Basel, 1905, pp. 28*).—The elementary composition of the casein of milk from cows, goats, and guinea pigs was found to be practically identical. The average in round numbers was as follows: Carbon, 53; hydrogen, 7; nitrogen, 15.5; sulphur, 0.7; phosphorus, 0.8; and oxygen, 23 per cent.

The chemistry of milk and milk products in 1906, M. Siegfeld (*Chem. Ztg., 31 (1907), Nos. 56, pp. 701, 702; 57, pp. 714, 715*).—A review of the literature of this subject during 1906 with 126 references.

Report of the chemist (division of foods and feeding), J. B. Lindsey (*Massachusetts Sta. Rpt. 1906, pp. 82–95*).—This part of the report on the chemical work of the station includes statements concerning the examinations made of water and feeding stuffs, studies made of analytical methods, the results of inspection of dairy apparatus, and the testing of pure-bred cows. An outline is also given of the chemical work completed and of that in progress. Of the 2,457 pieces of dairy glassware examined 763 pieces, or 31.05 per cent, were condemned.

The creamery inspection law, C. H. Jones (*Vermont Sta. Rpt. 1906, pp. 298, 299*).—During the 7½ years that this law has been in force the station has tested 53,875 pieces of Babcock glassware, finding 890, or 1.65 per cent, incorrect.

National association of dairy instructors and investigators (*Illinois Sta. Circ. 111, pp. 59, figs. 3*).—This circular gives the proceedings of a meeting of dairy instructors and investigators held at the University of Illinois, July 17, 1906, at which time an association known as the National Association of Dairy Instructors and Investigators was organized. The following subjects were discussed: The manufacture of condensed milk, by O. F. Hunziker; a plan for the registration of dairies leading to the improvement of market milk, by C. B. Lane; city milk supply, by J. M. Trueman; difference in efficiency of dairy cows, by W. J. Fraser; some hand separator problems, by C. H. Eckles; pasteurization of hand separator cream for making butter, by C. E. Lee; benefits to be derived from educational butter contests, by B. D. White; milking machines, by H. H. Dean; advantages of the organization of dairy instructors and investigators, by E. H. Webster; opportunities for research work in the manufacture of dairy products, by C. F. Doane; how shall we conduct feeding experiments with dairy cows? by B. E. Carmichael; dairy instruction, by H. E. Van Norman; soft cheese problems, by C. Thom; reaching the farmer, by E. S. Guthrie; and testing dairy herds, by H. A. Hopper.

The preparation of unfermented apple juice, H. C. Gore (*U. S. Dept. Agr. Yearbook 1906, pp. 239–246, fig. 1*).—This article gives the results of experimental work in preparing unfermented apple juice. The method evolved consists in clarifying the juice by passing it through a centrifugal cream separator, bottling or putting in cans, carbonating if desired, and sterilizing by heating at about 70° C. for one-half hour. The composition of the juice was not appreciably affected by the process.

Studies on apple juice, H. C. GORE (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 1112–1119*).—Chemical work carried on in connection with the above investigations is here reported. Analyses are given of (1) juices of cull apples, (2) juices from the cider mill at various times during the season, (3) juices of several standard varieties of apples grown in Nebraska, (4) fresh and fermented juices of summer apples, and (5) juices of decaying apples.

VETERINARY MEDICINE.

Handbook of forensic veterinary science, B. MALKMUS (*Handbuch der Gerichtlichen Tierheilkunde. Hannover: M. & H. Schaper, 1906, pp. XV+687*).—This constitutes a comprehensive treatise on the legal position and duties of the veterinarian as based upon German laws. The subjects discussed in the volume include guarantees, deceit, excessive charges, and other illegal dealings in connection with the sale or transfer of domestic animals.

The chief and secondary defects of domestic animals from a legal standpoint are defined and notes are given on the pathological conditions which determine these defects.

Veterinary science in its relation to agriculture, L. J. BLENKINSOP (*Transvaal Agr. Jour., 5 (1907), No. 19, pp. 599–603*).—The author briefly refers to the great losses caused by animal diseases in various parts of the world in connection with a statement of the economic importance of veterinary science in the further advancement of agriculture.

A new feeding method and its relation to veterinary science, J. J. WESTBROEK (*Tijdschr. Veeartsenijk., 34 (1907), No. 8, pp. 485–516*).—According to the author the common belief in the necessity of salt in the diet for domestic animals is not well founded. It is argued that the addition of salt to the ration causes more or less serious disturbances in the normal osmotic processes, at times greatly changing the composition of the tissues and fluids of the animal body. Tables are presented showing the striking modifications which common salt may produce in the amount of potash, sodium, magnesium, lime, and other minerals in the flesh of hogs and cattle.

The author claims that common salt, when added to the ration, gradually replaces the salts which should be present in animal tissues and causes pathological conditions.

A consideration of some of the modern theories in relation to immunity, P. C. FREER (*Philippine Jour. Sci., 2 (1907), No. 2, pp. 71–81*).—A critical review is given of the various theories which have been proposed in explaining immunity, particularly from a chemical standpoint.

The mechanism of nonbactericidal immunity, E. WEIL (*Arch. Hyg., 61 (1907), No. 4, pp. 293–323*).—If the complement is removed from the body cavity of guinea pigs by precipitation, the immune serum of fowl cholera becomes inactive and the course of infection in the absence of the complement is much more rapid than is the case in normal animals. The function of the complement can apparently be performed by leucocytes if such be present. The author was unable to demonstrate any combination of immune serum with fowl cholera bacilli in the animal body. It was also impossible to determine the action of the immune serum upon the leucocyte. The author maintains that since the complement, which is so important an agent in immunity, does not exercise a bactericidal function it must possess some other function.

The prospect of a practical method of preventive vaccination against foot-and-mouth disease, M. Casper (*Berlin. Tierärztl. Wchnschr., 1907, No. 20, pp. 399–405*).—The methods which have thus far been proposed for preventive vaccination against foot-and-mouth disease are classified by the author into 4 groups in which the following materials are used: Blood, serum, or milk of animals which have recovered from the disease; the blood or serum of artificially immunized animals; virulent or attenuated lymph, and blood or serum combined with the lymph of artificially immunized animals. The technique of each of these methods is described and notes are given on the results thus far obtained from their application. In the author's opinion the strict maintenance of quarantine measures must still be considered as the chief means of preventing the spread of foot-and-mouth disease for the reason that no efficient and practical method of preventive vaccination has been devised.

Veterinary department (*Massachusetts Sta. Rpt. 1906, pp. 206, 207*).—A pathological collection is being made and information is being disseminated among farmers regarding important diseases of live stock.

Stock diseases, F. Clutterbuck (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 4, pp. 235–244*).—Brief mention is made of some of the more important animal diseases, including lung worms of sheep, tuberculosis, pleuro-pneumonia, and hog cholera, the means by which they are spread, and the importance of meat inspection in locating centers of infection.

Some notes on the prevalence of the different contagious diseases at present existing in the Transvaal, R. H. Williams (*Transvaal Agr. Jour., 5 (1907), No. 19, pp. 673–676*).—Brief statements are made regarding the present status of East-coast fever, sheep scab, glanders, tuberculosis, hog cholera, etc.

Notes from practice, E. Diem (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 22, pp. 421–425*).—A brief account is given of petechial fever following upon strangles in horses. Striking success was had in the treatment of pulmonary gangrene with potassium iodid. Short notes are also given on peritonitis in cattle and horses, cerebral hemorrage, and vaginitis.

Medicinal treatment of infectious diseases, Gmeiner (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 22, pp. 305–309*).—A general account is given of the use of medicinal agents in counteracting infectious diseases. Among these substances mention is made of the various alkaloids and the active principles of digitalis, strophanthus, and camphor.

Operative treatment of actinomycosis, Dorn (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), Nos. 17, pp. 321–326; 18, pp. 341–347; 19, pp. 361–366*).—A detailed record is given of the results noted from the operative treatment of a number of cases of actinomycosis. The author concludes that it is possible to remove the actinomycotic tissue so thoroughly that the disease will not recur. In this operation it is recommended that the skin be removed over the whole tumor together with the tumor and that care be exercised in the operation not to produce any pockets in the incised tissue. An antiseptic application should be made after the operation, and the pressure produced in drawing the edges of the skin together over the wound serves to establish drainage until healing takes place.

Trypanosome infection through the mucous membrane of the alimentary tract, W. L. Yakimoff and N. Schiller (*Centbl. Bakt. [etc.], 1. Abt., Orig., 43 (1907), No. 7, pp. 694–702*).—In experimental rodents it was shown that infection with trypanosomes might take place through the mucous membrane of the alimentary canal. Infection was favored by the diminution of the peristaltic motion of the intestines, while neutralizing the gastric juice appeared to have no influence upon the process of infection. The same may be said for fasting preceding the feeding of animals upon virus containing trypanosomes.

Notes on baleri, L. Cazalbou (*Rev. Gén. Méd. Vét., 9 (1907), No. 106, pp. 564–572, figs. 2*).—The blood parasite of this disease was found in horses in conjunction with *Trypanosoma brucei.* It is believed, however, to be a distinct species. Baleri is a trypanosomiasis of horses characterized by repeated and violent attacks of fever, swellings in various parts of the body, pronounced injection of the conjunctiva, and general emaciation.

The trypanosomiases of the Upper Nile, A. Laveran (*Ann. Inst. Pasteur, 21 (1907), No. 5, pp. 321–356, figs. 3*).—The symptoms and pathological anatomy of souma and baleri are described in detail, and notes are given on *Trypanosoma cazalboui, T. pecaudi,* and *T. soudanense.* Souma chiefly affects horses, mules, and cattle, while most laboratory animals appear to be immune. Baleri is most commonly observed in horses, cattle, sheep, and goats. The disease due to *T. soudanense* has not received a specific name, but affects goats, sheep, dromedaries, dogs, and various other animals: Notes are given on a number of biting flies which may be concerned in the transmission of this disease.

The trypanosomiasis in French Guinea, G. Martin (*Ann. Inst. Pasteur, 21 (1907), No. 5, pp. 357–383, figs. 11*).—The trypanosomiasis commonly observed in mules and cattle in French Guinea and in other regions along the Niger is due to *Trypanosoma dimorphon.* The biology of this organism is described, and notes are given on the results obtained from inoculation experiments with this blood parasite. Mention is also made of the biting flies of the region which may be concerned in the transmission of the disease.

A study of rabies, C. Fermi (*Arch. Path. Anat. u. Physiol. [Virchow], 188 (1907), No. 3, pp. 428–469*).—In this study particular attention is given to the susceptibility of rats and mice to rabies virus and the virulence of fixed rabies virus in different laboratories. In experiments with rats and mice it appeared that death took place nearly as soon after subcutaneous as after subdural inoculation.

Is the cerebro-spinal fluid of rabid animals virulent? B. V. Fursenko (*Arch. Vet. Nauk [St. Petersb.], 36 (1907), No. 2, pp. 99–103*).—A series of inoculation experiments was made by the author for the purpose of determining whether the cerebro-spinal fluid of dogs affected with rabies contained the virulent virus of the disease. The results were negative in all cases and indicate that this fluid does not contain the virus.

The attenuation of fixed rabies virus necessary to render this material innocuous for rats and mice, C. Fermi (*Centbl. Bakt. [etc.], 1. Abt., Orig., 43 (1907), No. 7, pp. 709–713*).—Inoculation experiments carried out on 71 rats and mice of different species indicate that fixed virus attenuated for 3 days according to the Pasteur method is perfectly harmless for these animals. In every case the experimental animal remained alive and showed no evidence of infection.

In further experiments by the author it appeared that the virulence of rabies virus from wolves is greater than that from other animals.

The treatment of rabies with radium, A. Calabrese (*Ann. Inst. Pasteur, 21 (1907), No. 2, pp. 156–160*).—This article is largely of a controversial nature, in which the position is taken that the results announced by Tizzoni and Bongiovanni on the effect of radium are by no means always to be observed. According to the investigations of the author virus is not always destroyed by radium rays, and the tissues immediately subjected to the action of the rays may be seriously affected.

Persistence of rabies virus in the saliva of dogs after recovery from the disease, P. Remlinger (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 15, pp. 800–803*).—It has already been shown that the saliva of dogs may contain rabies virus before the external symptoms of the disease appear. In the observations reported in the present paper the author noted that the saliva may remain virulent for several days after complete recovery has taken place.

The mode of absorption of tetanus toxin, P. Cernovodeanu and V. Henri (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 15, pp. 812–815*).—In a study of the absorption of tetanus toxin it was found that the movement of the toxin could be checked as effectively by severing the blood vessels of the leg in which the injection was made as by severing the nerves. If the blood vessels are severed and the muscles of the thigh ligatured, large doses of tetanus toxin may be injected into the extremity of the leg without causing tetanus. The toxin in such cases, however, remains virulent and the portion of the sciatic nerve beyond the ligature absorbs the tetanus toxin.

The influence of high temperature on the course of experimental tetanus and streptococcic infection, O. Ritzmann (*Arch. Hyg.*, *61* (*1907*), *No. 4, pp. 355–384*).—In experiments with various laboratory animals it was found that mice maintained at a temperature of 35° C. became infected with tetanus much more readily than when kept at ordinary living temperatures. The effect of temperature upon tetanus infection with guinea pigs, however, was less striking.

The influence of cold upon experimental tetanus, Ciuca (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 16, pp. 858, 859*).—Experiments with small laboratory animals have already shown that cases of tetanus progress more rapidly and assume a more virulent form when the animals are subjected to excessively high temperatures. The author also found that similar effects were produced by subjecting the animal to low temperatures. The resistant power of the animal appears to be thereby reduced.

The action of sunlight upon bacteria with special reference to Bacillus tuberculosis, J. Weinzirl (*Jour. Infect. Diseases, 1907, May, Sup. 3, pp. 128–153, pls. 2*).—The author made a study of the various methods which have been used in determining the effect of sunlight upon bacteria. Objections are found to most of these methods in that they do not constitute true exposures, the bacteria being covered with glass or other material which absorbs and reflects some of the sun's rays. When bacteria were directly exposed to the rays of the sun without any covering over them, the author found that the germicidal action of sunlight was much more effective than it had previously been considered.

The organisms upon which observations were made were the bacilli of tuberculosis, typhoid fever, cholera, diphtheria, etc., but particular attention was given to the tubercle bacillus. It was found that this organism as well as other pathogenic nonspore-bearing bacteria is destroyed in from 2 to 10 minutes by direct exposure to sunlight. According to the author, the hygienic importance of sunlight has been considerably underestimated and nonspore-bearing bacteria, when freely exposed, are killed in from one-fifth to one-twentieth of the time previously considered necessary.

Cultural properties of tubercle bacilli, J. von Szabóky (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig.*, *43* (*1907*), *No. 7, pp. 651–660*).—Detailed notes are given on the growth and behavior of tubercle bacilli on various culture media including lung agar, sputum agar, eggs, and tuberculous lung agar.

Protective vaccination of cattle against tuberculosis, F. Hutyra (*Ztschr. Tuberkulose*, *11* (*1907*), *No. 2, pp. 97–122*).—In the earlier experiments made by the author in testing von Behring's method of vaccinating cattle, results were obtained which led to a quite optimistic expression of belief in the permanent value of this method. Later experiments have caused the author to speak of the method with greater reserve. It appears that the resistance conferred by von Behring's method against subsequent intravenous injection with tubercle bacilli declines quite rapidly and disappears entirely toward the end of the first year. The resistance of inoculated cattle toward natural infection from other tuberculous cattle is never striking and disappears after a few months.

In further experiments to test von Behring's method 2 intravenous vaccinations were given in the place of the one previously recommended. It was found that the resisting power of cattle thus treated was at first very pronounced or almost absolute, but that it was not of long duration, disappearing entirely within 18 months. The author concludes from his experiments that at present the only method for controlling tuberculosis which has stood practical test is that of Bang.

An unusual form of tuberculosis in hogs, J. Böhm (*Ztschr. Fleisch u. Milchhyg., 17 (1907), No. 9, p. 311*).—In the examination of a case of advanced tuberculosis in a hog it was found that tubercles were present not only in the organs usually affected, but also in the fat tissue. The tubercles in the fat tissue showed no anatomical connection with muscle fibers or with lymph or blood vessels.

Tuberculosis in the region of certain canals near Modena, R. P. Rossi (*Clin. Vet. [Milan], 30 (1907), No. 1, pp. 2-7*).—A study was made of tuberculous cats and rats in the region of certain canals which were contaminated to some extent with tubercle bacilli. The author comes to the conclusion that fluid contaminations which enter the canal may have contributed to the increased percentage of tuberculosis among these animals, but that the refuse meat material transported in the canals is the chief source of the disease.

Distribution of tuberculin and mallein by the Bureau of Animal Industry, M. Dorset (*U. S. Dept. Agr. Yearbook 1906, pp. 347-354*).—Attention is called to the great importance of means for the diagnosis of infectious diseases in advance of the development of clinical symptoms. A brief historical statement is given of the use of tuberculin and mallein in detecting tuberculosis and glanders. The Bureau of Animal Industry furnishes tuberculin and mallein to Federal, State, county, or city officials under an agreement that the latter furnish records of the tests and of autopsies upon all animals which are slaughtered. During the fiscal year 1905-6 103,000 doses of tuberculin and 10,000 doses of mallein were distributed.

Observations on the mallein test, W. Jowett (*Vet. Rec., 19 (1907), No. 983, pp. 725-729*).—Considerable difference of opinion has prevailed regarding the length of time which should be allowed to elapse after one mallein injection before another one is given in cases of doubtful reaction. This matter has been carefully studied by the author, with the result that the interval between 2 mallein injections apparently need not be longer than a few days or merely long enough to allow the animal to return to a normal temperature. In a study of mallein reactions the thermic reaction appears to be more delicate and reliable than the local reaction at the point of injection.

Experimental glanders in guinea pigs, M. Nicolle (*Ann. Inst. Pasteur, 21 (1907), No. 4, pp. 281-294*).—A series of inoculation experiments was carried on in testing the reaction of guinea pigs to glanders virus obtained from different sources and subjected to different conditions of environment. When intracardiac injections of glanders virus were made, the external symptoms of the disease appeared after about 3 days in the form of pustular eruptions. An attenuated virus introduced directly into the heart appears to be the most effective way of producing immunity against glanders in experimental animals.

The author found that in a small percentage of cases subcutaneous inoculation of a mixture of normal serum and active virus produced a resistance in the experimental animal.

The conditions for formation of the capsule of the anthrax bacillus, T. STIENNON (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 15, pp. 821-823*).—The capsule appears most regularly and in a most pronounced manner on anthrax bacteria in infected animals. Bacilli with capsules are not surrounded with phagocytes and cause death more rapidly than nonencapsuled bacilli. The virulence of the bacilli with capsules was always greatest.

Decisions of the imperial health officials regarding the appearance of anthrax in cattle in the Schmeie region, GÄRTNER and C. DAMMANN (*Arb. K. Gsndhtsamt.*, *25* (*1907*), *No. 2, pp. 416-456*).—For some time anthrax has occurred among cattle along the regions of the river Schmeie, and upon investigation by the imperial health office it was found that in one part of the valley 103 cases had occurred during the past 12 years among 1,600 cattle, while in another section 138 cases had occurred among 46,000 cattle. The extent of infestation varied greatly in different parts of the valley, according to the favorable or unfavorable conditions for the distribution of the anthrax bacillus.

In the region in question there are a number of tanneries, and these institutions are directly connected with the spread of anthrax. The organisms gain entrance to the flowing streams through the waste water and subsequently infect cattle lower down the stream. In the opinion of the authors, it is impossible to control this trouble by the rejection of infected hides at the point of entrance into the Empire or by ordinary methods of furnishing a water supply for stock in the infected area. These methods may lessen the extent of anthrax to some extent, but can not prevent the appearance of the disease. The only effective means of controlling this trouble is found in the disinfection of all waste water from tanneries.

Mammitis in cows, H. CARRÉ (*Rev. Gén. Méd. Vét.*, *9* (*1907*), *No. 106, pp. 561-564*).—In cases of contagious mammitis observed by the author an organism was isolated which is described as new under the name *Bacillus mastitidis contagiosæ*. This organism appears not to be a rare one and is believed by the author to be of considerable importance in the etiology of mammitis.

The station for the control of rinderpest at Chita, M. P. SLYESAREVSKI (*Arch. Vet. Nauk* [*St. Petersb.*], *36* (*1907*), *No. 2, pp. 104-132*).—This station has been in operation since 1901, receiving both government and private funds. Its main purpose is the study of rinderpest and in the different laboratories connected with the institution and in the cattle corrals and stables experiments are being carried on to determine the means by which the disease is transmitted and the value of the various methods of immunization which have been proposed for controlling it.

Poisoning of cattle from Taxus baccata, GRIMME (*Deut. Tierärztl. Wchnschr.*, *15* (*1907*), *No. 23, pp. 321, 322*).—In several cases poisonous symptoms were produced in cattle as a result of eating *Taxus baccata*. A post-mortem examination was made of one animal during which it was found that the liver and spleen were considerably swollen and that the exterior of the rumen was grayish red. Reddened spots were also observed in the small intestines.

On the chromatin masses of Piroplasma bigeminum, the parasite of Texas cattle fever, H. B. FANTHAM (*Quart. Jour. Micros. Sci.* [*London*], *n. ser.*, *51* (*1907*), *No. 202, pp. 297-324, pl. 1, figs. 44*).—In all specimens of *Piroplasma bigeminum* stained and examined by the author there was one or more chromatin masses. In the ovoid and pyriform parasites there is usually a large chromatin mass and also a smaller, denser one as well as a mesh-like structure of chromatin. A number of variations occur in the relative positions and relative sizes of these different chromatin bodies.

On the cultivation of a bovine piroplasma, M. MIYAJIMA (*Philippine Jour. Sci.*, *2* (*1907*), *No. 2, pp. 83-91, pls. 2*).—For some time the author has noticed the presence of a protozoan organism closely resembling *Piroplasma parvum* in Japanese cattle. Further study of this organism indicated that it belongs to the species *P. parvum* and is found in Japanese and Korean cattle. The organism may be readily cultivated outside of the animal body by the use of suitable nutrient media. The parasites undergo a developmental change in blood bouillon, finally taking the form of a typical trypanosome which is not to be detected in the blood of infected animals. According to the author a simple mixture of blood and bouillon is the most suitable mixture for the cultivation of *P. parvum* and *Trypanosoma lewisi.*

Studies on the morphology and life history of Piroplasma canis, G. H. F. NUTTALL and G. S. GRAHAM-SMITH (*Jour. Hyg.* [*Cambridge*], 7 (*1907*), *No. 2, pp. 232–272, pls. 3, figs. 14*).—The biology and life history of the blood parasite of canine piroplasmosis was carefully observed for 550 hours in order to determine as nearly as possible the different stages under which this parasite appears. The observations made by the authors indicate the occurrence of morphological changes in this parasite somewhat different from those hitherto described.

It appears that a free pyriform parasite, after entering a red blood corpuscle, ordinarily assumes a round form, then enlarges, becomes amœboid, and again rounded. After a short resting period two symmetrical processes are protruded, become pear-shaped, absorb the protoplasm of the mother cell, and finally separate into two free parasites.

A new preparation for the treatment of acute and chronic swine plague, BUROW (*Berlin. Tierärztl. Wchnschr., 1907, No. 23, pp, 450–452*).—Laboratory experiments have been carried on for the past year and a half in an endeavor to produce a bacterial preparation which will be effective in the treatment of swine plague. The product, which is prepared under the author's direction, has been obtained and has been tested on about 700 hogs with quite satisfactory results. The coughing and other external symptoms of swine plague disappear within 3 or 4 days. The preparation is claimed to be absolutely harmless and is administered hypodermically in doses of 5 cc.

Exostoses on the metacarpus of the horse, V. OELKERS (*Monatsh. Prakt. Tierheilk., 18* (*1907*), *No. 8–9, pp. 337–384, pls. 6, figs. 5*).—The literature relating to splints is critically reviewed in connection with bibliographic references. The present article is a report on one of the most extensive investigations thus far made of the anatomy and etiology of splints in horses. An examination was made of 652 army horses, with the result that 68 per cent was found to be affected. The splints observed in the 448 cases could readily be classified into intermetacarpal, postmetacarpal, and traumatic splints. The anatomical features of each of these different groups of splints are presented in detail.

As a result of these investigations, the author comes to the conclusion that the exostoses commonly known as splints are caused primarily by the friction of the interosseous ligament at its fixed points upon the underlying bones. This friction causes a gradual ossification in the ligament, which, by extension upward and downward, may cause an unusual strain upon the tendons and ligaments which are attached to the posterior angle of the normal splint bones leading to a periostitis the result of which is the pathological splint known to veterinarians.

In the treatment of splints the author recommends rest for all cases and external applications which are likely to induce a resorption of the bony process. If the case seems to warrant surgical interference, the bone growth may be removed by an operation.

Staggers or forage poisoning in horses, S. S. CAMERON (*Jour. Dept. Agr. Victoria, 5* (*1907*), *No. 4, pp. 242–246*).—Rather extensive fatalities have occurred among horses in various parts of Victoria, apparently as a result of eating injurious forage. In one outbreak the trouble was due to feeding oat hay which had been allowed to become moldy in the butts of the sheaves. The exact cause of the disease has not been determined, and further study is necessary to elucidate its etiology.

Diseases of fowls, G. BRADSHAW (*Agr. Gaz. N. S. Wales, 18 (1907), Nos. 1, pp. 26–39; 3, pp. 207–213, figs. 2*).—An account is given of the symptoms, post-mortem appearances, and method of treatment in cases of roup and fowl cholera.

Roup, L. E. W. BEVAN (*Rhodesian Agr. Jour., 4 (1907), No. 4, pp. 392–397*).—The symptoms and occurrence of this disease are briefly discussed. In preventing roup it is recommended that strict quarantine measures be observed, that careful supervision be exercised in the selection of food and water supply for fowls, and that affected birds be placed in small rooms or boxes and fumigated with formaldehyde.

Sleepy disease in fowls, C. DAMMANN and O. MANEGOLD (*Arch. Wiss. u. Prakt. Tierheilk., 33 (1907), No. 1–2, pp. 41–70, pl. 1*).—An affection of fowls known under the name of sleepy disease has appeared here and there since 1904. According to the authors this disease is due to *Streptococcus capsulatus gallinarum*. The organism is described and notes are given on its behavior on different culture media and upon its resisting power. It is destroyed by subjection to a temperature of 100° C. for one-half minute or 50° C. for 20 minutes. The organism is quite susceptible to the action of disinfectants such as carbolic acid, cresol, etc.

The streptococcus in question shows a high pathogenic power for fowls and is present both in the blood and affected organs. The incubation period varies from 6 to 14 days and the course of the disease from 1 to 3 weeks. One of the most striking symptoms is the persistent sleepiness. The feathers are ruffled and catarrh is apparent upon the mucous membranes and conjunctiva.

An arthritis in geese and ducks caused by Staphylococcus pyogenes aureus, FREESE (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 23. pp. 322–324*).—Affected birds become more or less emaciated and show symptoms of lameness or even inability to walk. In the joints in which the chief lesions occur a serous or sero-fibrinous inflammation is observed together with a hemorrhagic condition of the bone marrow. In chronic cases of the disease a purulent ostitis is observed. In inoculation experiments negative results were obtained with common fowls, pigeons, and rabbits. No direct treatment for the disease has been devised and reliance must, therefore, be placed upon prophylactic and disinfectant measures.

RURAL ENGINEERING.

Irrigation in the Yakima Valley, Washington, S. O. JAYNE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 188, pp. 89, pls. 2, figs. 4*).—This bulletin describes the Yakima Valley by sections, giving the areas, crops, physical features, climate, water supply, water rights, and systems of distribution. The chief canals are described as to their dimensions, the area covered, the area irrigated, and the system of management.

The practice of treating the interior of flumes with asphaltum or tar, or a mixture of the two, has been adopted to some extent as a means of preserving the material and preventing leakage. It is stated that for new structures and dry lumber the use of either material may be recommended.

The cost of preparing and seeding new lands, as given for a number of sections of the valley, varies from $10 to $50 an acre, depending upon the amount of vegetation to be removed and the condition of the surface of the land. The cost of water rights in different canals in the valley varies between $25 and $75 per acre, while the annual assessments to cover maintenance vary from $1 to $2 per acre.

Duty of water measurements are given for a large number of canals, covering in some instances several years. Measurements for the Sunnyside Canal cover 7 years and show a constant decrease in the quantity of water used from 1898, when the average depth used was 11.4 ft., to 1906, when the average depth used was 6.5 ft. General statements for 18 of the larger canals show variations in depths used of from 3 to 12½ ft.

The use of these large quantities of water, together with the leakage from ditches, has injured much land and made drainage necessary in several sections. Seepage measurements on one canal showed losses of from 1 to 3 per cent of the volume carried per mile of ditch.

The report closes with a statement regarding the work of the Reclamation Service in the Yakima Valley.

Seepage and drainage, I, E. T. TANNATT and A. P. ANDERSON (*Montana Sta. Bul. 65, pp. 63, pls. 4*).—This bulletin calls attention to the evils of over-irrigation and leaky irrigation ditches and describes the drains installed upon a part of the Montana Station farm at Bozeman. The field drained had a thin top soil of muck and loam underlaid by gravel of undetermined depth. The drains were first used, but it was found that the joints became cemented, probably by silt carried in the irrigation water, rendering the drains useless. Box drains without bottoms were substituted and proved successful, while in addition they were cheaper than the tile drains. Detail drawings of the box drains and a bill of materials are given.

Reclamation of tide lands, J. O. WRIGHT (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 373–397, pls. 5, figs. 6*).—This paper is a general statement regarding the extent of tide lands, their value when reclaimed, and methods of reclamation. The soil of these marshes is composed of sediment mingled with the remains of animal and vegetable life. Chemical analyses of numerous samples and yields of crops grown on reclaimed tracts show that they are very productive and that, with proper treatment, including the leaching out of excess salt, they are extremely valuable.

The general method of reclamation is diking to keep out tide water and internal drainage. Where the variation between high and low tide is sufficient drainage can be accomplished by the use of automatic tide gates which allow the drainage water to escape at low tide. Where this difference is small it is necessary to pump the drainage water over the dikes. The dikes may be constructed by hand, with teams and scrapers, or with dredges, depending upon the size necessary. The reclamation of these marshes has been successful where dikes have been properly constructed and protected, and failures can in most cases be attributed to neglect of the proper precautions. The essentials of a dike are a wide berm between the water and the foot of the dike, flat slopes properly protected, and proper preparation of the foundation to insure a good joint between the natural earth and the embankment. Slopes on the water side should not be less than 3 to 1 and on the land side not less than 2 to 1. All vegetable matter should be removed from the foundation and intercepting ditches should be excavated and refilled just inside of each toe of the dike.

Dredges of different kinds are described and drawings and bills of material for both concrete and timber tide gates are given.

Object-lesson roads, L. W. PAGE (*U. S. Dept. Agr. Yearbook 1906, pp. 137–150, pls. 4*).—In this article Director Page outlines the work of the Office of Public Roads of this Department, showing that its work is divided into two general classes—the economic questions of road management and the practical features of road construction and maintenance.

The object-lesson road is the method chosen for making available the results of investigations of the office in road construction. "Briefly stated, the purposes of object-lesson roads are, first, to introduce among local road builders correct methods of construction and maintenance; second, to demonstrate the advantages of a properly built road in order to stimulate public sentiment for road improvement and arouse a spirit of progress; third, to afford a basis for estimating cost of additional road construction, which may be subsequently carried on by the county or community; fourth, to demonstrate the availability and relative value of local materials as far as practicable."

Tables are given showing the location of object-lesson roads constructed in 1904–5 and 1905–6, showing the kind and source of material, the distance transported, the dimensions of the road, the cost per square yard and per mile, and the cost of labor per day. Reports regarding the present condition of a number of the roads built are included in the paper.

A rotating traction plow, C. Lumia (*Coltivatore, 53 (1907), No. 17, pp. 529–532, fig. 1*).—The author describes a very unusual type of plow in which the ordinary plowshare is replaced by a pair of auger-like screws which precede the machine and are rotated in opposite directions with respect to each other as the machine moves forward. The machine is operated by a gasoline motor and is self-propelling. It is claimed to possess certain advantages in giving the soil a more thorough stirring than is possible with the ordinary plow. Turning and operating the plow leaves $\frac{1}{11}$ of the area of the field upon which it is used unplowed, and in a 10-hour day it is claimed that 2.5 acres may be plowed to a depth of 8 in. in compact soil at a total expense of $7.60, with gasoline at a price equivalent to 40 cts. per gallon.

Corn harvesting machines, M. Ringelmann (*Jour. Agr. Prat., n. ser., 14 (1907), No. 32, pp. 172–175, figs. 6*).—Various simple American devices for this purpose are described.

On the peculiarities of denatured alcohol (*Masch. Ztg., 5 (1907), No. 7, p. 80*).—Apparatus using denatured alcohol such as motors and incandescent lamps, is often injured and its working parts corroded by the products liberated in the process of combustion. The question has arisen as to which of the materials in consideration, the alcohol itself with its impurities such as aldehyde and ether, or the denaturing materials like methyl alcohol, benzine, etc., is the agent responsible for the corrosive effect. The denaturants have formerly been held in suspicion, but recent investigations by Lindet, Heinzelman, and others have shown that the usual impurities of undenatured alcohol, viz, aldehyde and ethyl acetate, may cause corrosion to a greater or less degree, though the time required to effect noticeable injury is longer than with the denatured alcohol. The effects of using the latter are briefly summarized as the formation of acetic acid, the clogging of the inlet and outlet valves, corrosion of the motor cylinder, clogging and corrosion of burners, hardening of wicks, and early destruction of the wire parts of incandescent burners.

The means recommended to obviate this trouble is the removal of the aldehyde and acetates to the greatest possible extent and the use of benzine of a not too high boiling point.

RURAL ECONOMICS.

Freight costs and market values, F. Andrews (*U. S. Dept. Agr. Yearbook 1906, pp. 371–386*).—The author discusses the cost of hauling from farms and the prevailing freight rates on cotton and wheat in 1906 to the principal shipping and exporting points in the United States, the ocean freight rates to the

United Kingdom, and the effect of the various charges on the price of these staple farm products.

The estimated average cost of carrying cotton and wheat in the United States and to the United Kingdom during the year ended June 30, 1906, is as follows: From local shipping points to seaports, 40 cts. per 100 lbs. for cotton and 12.6 cts. per bushel for wheat; from all ports to Liverpool, 32 cts. per 100 lbs. for cotton and 9.6 cts. per bushel for wheat. At Galveston, New Orleans, Savannah, and New York, which are the 4 principal export points for cotton, the mean of the daily closing prices for Upland middling cotton was 11 cts. per pound, while in England the mean price was 12.1 cts. per pound. The average price of wheat in Chicago, Minneapolis, and Kansas City was 85.1 cts. per bushel, while the average import value of all wheat brought into the United Kingdom from the United States was 95.9 cts. per bushel. The average freight rate on wheat to the United Kingdom from all exporting countries was 9 cts. per bushel for distances ranging from 3,000 to 15,000 miles, which rate was "only one and two-thirds times the cost of hauling over 9 miles of country roads in the United States."

"Judging from the changes during the past few generations, it is natural to expect that costs of freight on land and water may be lower in the future than at present. Improved methods of loading and unloading freight, economies in the disposition of cars and vessels so as to avoid more than at present the hauling of empty cars and the making of voyages in ballast, and an increase in the quantity of valuable freight paying high rates per unit of weight would all tend to lower the cost of transporting farm products."

The effect of wages and the cost of products in different systems of cultivation, WATERSTRADT (*Fühling's Landw. Ztg., 56 (1907), No. 10, pp. 329–341*).—The author gives the methods and results of investigations to determine what system of crop rotation will give the best financial returns when the factors entering into the cost of production are known. Six systems of rotation were tested, and the data regarding the number of hours of labor, cost of fertilizers, value of crops, etc., are tabulated and discussed. In general it is believed that there really is no best system of rotation, as managing ability, the cost of production, and the wages of labor are more important in determining final returns than any system of cultivation.

The agricultural and rural institutions of the world at the commencement of the twentieth century, L. GRANDEAU (*L'Agriculture et les Institutions Agricoles du Monde au Commencement du XX*^{e} *Siècle. Paris: Govt., 1905–6, vols. 1, pp. VII+754, figs. 193; 2, pp. 751, figs. 126; 3, pp. 752, figs. 130; 4, pp. 674, figs. 107*).—This is a general treatise on the agriculture of the world based on the agricultural and horticultural exhibits at the Paris Exposition in 1900. The statistics of each country are separately discussed and embrace every phase of agriculture, forestry, and rural economics. The data having been compiled from reliable sources, serve as useful comparisons of the population, agricultural production, and rural economy of nearly all nations of the world at the opening of the twentieth century.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 9 (1907), No. 9, pp. 65–72*).—Statistics and notes on the condition of crops, and the supplies, value, prices, and imports of farm and forest products in the United States and foreign countries are summarized.

[**Agricultural statistics of Belgium**] (*Ann. Statis. Belg., 37 (1906), pp. XLI–XLVIII, 285–313*).—Statistical data on the agricultural population, wages of laborers, extent of arable land and forests, quantity and prices of products, number of live stock, etc., are tabulated and discussed. The data in general are given for the years 1880 to 1895, but in some instances are brought down to 1905.

Agricultural credit [in Brazil], J. I. Tosta (*Bol. Dir. Agr. Bahia, 9 (1907), No. 3, pp. 227-232*).—This article gives sections of the laws passed in 1907 authorizing the establishment of cooperative societies in Brazil and a government loan of a million dollars to promote credit among the peasantry on the basis of personal security. In discussing these laws the author points out that "the government loans money to an agricultural bank at 4 per cent interest, the bank lends to cooperative societies at 5 or 6 per cent, . . . and the society loans to members at 8 per cent," and by this means the poor peasant is able to borrow money with no security at the same rate of interest which landowners have to pay in Brazil on the basis of real estate.

Report on the agricultural bank in the Philippines, E. W. Kemmerer (*Rpt. Philippine Com., 1906, pt. 1 pp. 485-641*).—This report discusses the agricultural conditions of the Philippine Islands, the high rates of interest (10 to 120 per cent) charged by money lenders in different provinces, the various forms of agricultural credit adopted in many countries, and suggests plans believed to be best suited to present Philippine conditions. The law passed by Congress since the submission of the report is included, together with appendixes on agricultural credit in the Philippines, the agricultural bank of Egypt, the provisions of the code of commerce concerning mortgage and agricultural banks, the statutes of the East Prussian and West Prussian Landschafts, the French law regarding societies for the grant of land credit, the articles of the "Credit Foncier of France," the laws and regulations relating to the Hungarian Boden-Kredit Institut, extracts from the laws and regulations regarding real credit in Italy, the law relating to the mortgage bank of the Canton of Berne, Switzerland, abstracts of the agricultural banking laws of Australia and New Zealand, etc.

[Agriculture and cooperation in Denmark], J. L. Benton (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 2916, pp. 1, 2*).—Statistics show Denmark's population in 1906 to have been 2,600,000, of which 54 per cent belonged to the agricultural classes. Only one-fifteenth of the agricultural population are tenants or renters, the remainder being freeholders. The laws prevent the creation of large farms, and the following table shows the classification of farms in 1906:

Classification and total acreage of lands in Denmark, 1906.

Acres	Number	Total acreage.	Acres.	Number.	Total acreage.
7 or less	116,614	239,604	135 to 270	6,502	1,169,484
7 to 11	16,988	159,832	270 to 540	1,590	574,946
11 to 22	28,992	473,598	540 and over	822	964,327
22 to 33	17,723	496,962			
33 to 67	35,257	1,752,121	Total	250,103	8,177,169
67 to 135	25,615	2,246,295			

Out of the total acreage in farms, 5,267,900 acres belong to farms ranging in size from 33 to 270 acres in extent. In addition to the above there are some 68,000 small holdings containing about 4 acres each.

Statistics for 1906 show that there were 1,085 cooperative dairies with 158,170 members, 33 bacon factories with 91,000 members, and a cooperative egg exporting society with 500 local centers. Statistics of the business transacted by these organizations in 1906 are included.

General agricultural conditions in Calabria, D. Taruffi (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 4 (1907), No. 1, pp. 15-38*).—This article describes the geography, soils, river and road systems, population, climate, and agriculture of Calabria, and gives a survey of the economic conditions of the peasant classes.

As a whole Calabria is largely agricultural and had in 1901 a total of 1,370,208 inhabitants. Statistics are given which show, however, an increasing rate of emigration, 62,290 laborers having emigrated in 1905. From census figures the author calculates that for every 100,000 inhabitants 4,443 emigrants from Calabria in 1905 as compared with 2,161 for the whole of Italy. The conditions surrounding the home life of the peasantry are said to be exceedingly wretched, resulting in a high death rate, a steady stream of emigration, and great depression in agriculture.

AGRICULTURAL EDUCATION.

Progress in agricultural education, 1906, D. J. CROSBY *(U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 213–300, pls. 3, fig. 1)*.—This is an annual review of the leading features of progress in agricultural education in this country and abroad, including the general educational work of this Department and that of this Office, of the Association of American Agricultural Colleges and Experiment Stations, and of the different agricultural colleges, secondary schools, and primary schools throughout the country.

Considerable attention is given to the second session of the Graduate School of Agriculture at the University of Illinois, and to the development of secondary schools of agriculture in Maryland and Georgia. A course in agriculture for the Georgia schools is given in detail, as is also a suggestive course for the elementary public schools of California.

Statistics of land-grant colleges and agricultural experiment stations, 1906, MARIE T. SPETHMANN *(U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 177–212)*.—A compilation from official sources of general statistics, attendance, value of funds and equipment, and revenues of the land-grant colleges, and of the lines of work, revenues, and additions to equipment of the agricultural experiment stations in the United States.

District agricultural schools of Georgia *(Bul. Univ. Ga., 7 (1907), No. 11, Sup., pp. 47)*.—This bulletin contains a copy of the act providing for the establishment and maintenance of schools of agriculture and the mechanics arts in the respective Congressional districts of Georgia, a list of the trustees, the location of the schools, their faculties, resolutions of the board of trustees, a report of the committee on curriculum, a detailed description of the curriculum, lists of books on agriculture, and a schedule of hours.

The minimum age for entrance into these schools is 14 years for boys and 13 years for girls. The course of study extends through 4 years, including at least one year of common school or elementary studies. At least 3 hours a day of class-room work must be devoted to agriculture and related sciences.

The principals of the schools are to provide from time to time for such lectures on agriculture and the related subjects as the funds of the school will permit, and also for short courses for adult farmers in so far as the same may not conflict with the other work of the schools.

Students may be allowed fair compensation for work done on the farm or in the shop. One-fourth of the students, or such number as the principal may determine as necessary to continue the operation of the farm and shop, are to be required to remain on the farm during vacation. For work required during this time the students will be given fair compensation.

The State farmers' institute director is to arrange farmers' institutes at these schools and secure the help of their faculties in conducting institutes at other places.

Several of the schools are planning to open in January, 1907.

The farmers' institutes in the United States, 1906, J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 301–357*).—This is the annual report of the Farmers' Institute Specialist of this Office for 1906. It includes a discussion of the progress and problems of the institute movement, an account of the annual meeting of the American Association of Farmers' Institute Workers, a discussion of the agricultural education extension movement, and detailed reports and statistics on farmers' institutes in the different States and Territories.

Market-day lectures, 1905–6 (*Chelmsford: County Tech. Labs., pp. 136*).—These are reports of addresses to farmers delivered at Chelmsford and Colchester during the winter months. They relate to various phases of animal husbandry, dairying, crop production, poultry keeping, the uses of manure, and farm management.

Introduction of elementary agriculture into schools, A. C. TRUE (*U. S. Dept. Agr. Yearbook, 1906, pp. 151–164*).—An account is given of the growth of interest in the teaching of elementary agriculture in public schools as indicated by the attitude of men of prominence, farmers' organizations, school officers and teachers, and by recent State legislation. Progress in the formulation of courses in elementary agriculture, the preparation of text-books and manuals, the development of training courses for teachers, the organization of agricultural schools, and the number of pupils studying agriculture is reviewed and some suggestions are made concerning ways in which farmers may help the schools.

The training of the teachers of domestic science, MARY E. MARSDEN (*Rpt. Brit. Assoc. Adv. Sci., 1906, pp. 784–786*).—In this paper the author states that students who have had a good secondary education are those best fitted for special training in domestic science, but that the ideal preparation for a domestic science course is a science degree followed by a special training in domestic science. The following subjects are briefly discussed: Time and scope of training, suggested scheme of training, including arts and science, instruction and practice in method of teaching, including (1) the elements of psychology, the study of class management, and school organization, (2) blackboard drawing and elocution, and (3) actual practice in class teaching, and additional aids to the training of domestic science teachers, such as a reading room and reference library, literary and debating societies, and reading clubs.

The duty of education authorities to the nation respecting the teaching of domestic subjects, MARGARET E. PILLOW (*Rpt. Brit. Assoc. Adv. Sci., 1906, p. 786*).—An abstract of a paper read at the annual meeting of the British Association for the Advancement of Science in August, 1906, at York.

School training for home duties of women, A. SMITHELLS (*Rpt. Brit. Assoc. Adv. Sci., 1906, pp. 781–784*).—This paper is a plea for the development of a science of the household free alike from the pedantry of formal science and from the unprofitable memorizing of dietetic statistics. The author has found it possible to arrange a "course of science lessons in which scientific discipline and scientific method can be inculcated by simple experimental work, based entirely on matters of the household and of daily life; where the information acquired is truly useful knowledge, and where the minds of the pupils are awakened to the fact that the household is a laboratory of applied science that may constantly engage the intelligence."

The problem of girls' education in elementary schools, with special reference to training for home life, MILLICENT MACKENZIE (*Rpt. Brit. Assoc. Adv. Sci., 1906, p. 787*).—An abstract of a paper read at the annual meeting of the British Association for the Advancement of Science in August, 1906, at York.

School gardening, D. R. WOOD (*Jour. Ed.* [*Boston*], *65* (*1907*), *Nos. 16, pp. 428, 429; 17, pp. 457, 458*).—The first part of this article contains practical suggestions for locating the school garden and draining and enriching the soil, hints on arrangement, testing seeds, planting, watering, and what to plant in the way of vegetables, flowers, and trees. The second part gives a suggestive outline for work in the 8 grades, and lists of suitable vegetables, flowers, and plants for the school garden.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1906 (*U. S. Dept. Agr. Yearbook 1906, pp. 720, pls. 43, figs. 22*).—The Yearbook for 1906 contains a report of the Secretary on the work of the Department during the year, 25 special papers abstracted elsewhere in this issue, and an appendix consisting of an agricultural directory, a review of the progress in different lines of agriculture, and agricultural statistics.

Annual Report of the Office of Experiment Stations, 1906 (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1906, pp. 434, pls. XVI, figs. 13*).—This includes the usual report on the work and expenditures of the Office of Experiment Stations and the agricultural experiment stations in the United States, including Alaska, Hawaii, and Porto Rico; statistics of the agricultural colleges and experiment stations for 1906; a brief account of the nineteenth annual meeting of the Association of American Agricultural Colleges and Experiment Stations; and several articles and reviews abstracted elsewhere in this issue.

Thirtieth Annual Report of Connecticut State Station, 1906 (*Connecticut State Sta. Rpt. 1906, pt. 6, pp. XV*).—These pages include the organization list of the station, an announcement concerning the work of the station, a report of the board of control, and a financial statement for the fiscal year ended September 30, 1906.

Nineteenth Annual Report of Massachusetts Station, 1906 (*Massachusetts Sta. Rpt. 1906, pp. 218*).—This includes the organization list of the station, a report of the director, a financial statement for the fiscal year ended June 30, 1906, a report of the meteorologist, and other departmental reports abstracted elsewhere in this issue.

Nineteenth Annual Report of Vermont Station, 1906 (*Vermont Sta. Rpt. 1906, pp. 207–388*).—This includes the organization list of the station, a brief announcement concerning the station, a financial statement for the fiscal year ended June 30, 1906, a report of the director, abstracts of Bulletins 117–123 of the station issued during the year, the results of miscellaneous analyses, and numerous articles abstracted elsewhere in this issue.

Abstract of Nineteenth Annual Report, 1906 (*Vermont Sta. Bul. 129, pp. 91–152, pl. 1*).—This is a résumé of the annual report of the station noted above.

Sixteenth Annual Report of Wyoming Station, 1906 (*Wyoming Sta. Rpt. 1906, pp. 96*).—This includes the organization list, a report of the director on the work and publications of the station during the year, a financial statement for the fiscal year ended June 30, 1906, reports of the animal husbandman, the chemist, and the meteorologist abstracted elsewhere in this issue, and of the agriculturist and horticulturist, the botanist and the irrigation engineer, and plans of station work for the ensuing year. An appendix contains a classification of agricultural literature designed primarily for the use of animal husbandmen.

NOTES.

California University.—Leroy Anderson, at present in charge of the California Polytechnic School, has been appointed instructor in agriculture at the university and director of the farm schools at Fresno and Davis. A 3-day farmers' institute was held at Davis October 29 to 31 as a means of bringing the new institution into close touch with the public, at which President Wheeler and Director Wickson of the station were among the speakers.

Connecticut College.—Twelve-week courses in creamery practice, dairying, and pomology, a 6-week poultry course, and a 10-day course are announced in connection with the winter school to begin January 7, 1908.

Delaware College.—Director Hayward of the station has been appointed dean of the department of agriculture in the college.

Florida University.—According to a note in *Science*, H. S. Davis, Ph. D. (Harvard, 1907), has accepted an appointment as professor of biology.

Georgia Station.—H. N. Starnes, biologist and horticulturist, has resigned, to take effect January 1, 1908.

Illinois Station.—Andrew Ystgard, assistant in chemistry in the department of agronomy since 1904, died October 26, after a protracted sickness with typhoid fever. He was 34 years of age, a graduate of the Agricultural College of Norway and of the Trondhjem College of Engineering, and was for a time a student at the Wisconsin College of Agriculture.

Indiana University and Station.—A corn and stock judging school is to be held at Rushville from December 16 to 21, in charge of G. I. Christie and W. A. Cochel. Instruction will be given daily in the scoring of corn and stock, in addition to lectures. A course in domestic science has also been arranged. It is expected to reach a large number of farmers in this way who can not leave home to attend the short courses at the university.

H. A. Hopper, assistant in dairy husbandry in the Illinois University and Station, has been given charge of dairy field work and has entered upon his duties.

Kansas College and Station.—E. H. Webster, who was recently elected professor of dairying and dairyman, has decided to remain as chief of the Dairy Division of this Department.

Louisiana University and Stations.—F. H. Billings, professor of botany and bacteriology, has resigned to accept a corresponding position at the University of Kansas, and is succeeded by Reginald S. Cocks. Other appointments include A. F. Kidder, assistant in soil physics in the Illinois Station, as assistant professor of agronomy; S. W. Pipes, jr., as assistant in horticulture at the university; W. P. Naquin as assistant sugar chemist at the Audubon Park Station, and W. D. Morgan and R. Baus as assistant chemists at the Baton Rouge Station.

Maine Station.—In connection with the poultry investigations a laboratory has recently been built for use in the experimental work in breeding. The building has been designed with special reference to surgical work, and consists of a preparation room and general laboratory, a sterilizing room, and an operating room, arranged in series. For the better maintenance of aseptic conditions, the walls and ceilings are heavily coated with white enamel throughout, and all sharp angles and projections have been avoided in the construction.

Michigan College.—J. Fred Baker, professor of forestry in Colorado College, has been appointed professor of forestry to succeed E. E. Bogue, deceased.

Minnesota University and Station.—A. R. Kohler, instructor in horticulture at the Michigan College, has been appointed assistant horticulturist and has entered upon his duties.

Missouri University.—*Science* notes the appointment of Dr. P. F. Trowbridge as assistant professor of agricultural chemistry, and of N. D. Hendrickson, C. R. Moulton, and L. F. Shackel as assistants in the same department.

Nebraska Station.—Stella A. Hartzell has been appointed assistant in chemistry.

New Hampshire College and Station.—*Science* notes the appointment of W. M. Barrows as assistant in zoology.

New York State Station.—Recent changes in the station staff include the resignations of H. E. Hodgkiss, assistant entomologist, to accept a position with the State entomologist of Illinois, and of P. W. Flint, assistant chemist, to take up postgraduate work at the University of Illinois. A. R. Rose, assistant chemist, has been given a year's leave of absence for postgraduate work at Yale University.

North Dakota Station.—The bacteriological laboratory of the division of biology has been largely rearranged and more thoroughly equipped for the study of the indefinite flora of soil. The plant house of the botanical division has been fitted up with a complete temperature regulation system, by which the temperature of any room may be maintained quite constantly. The botanist is keeping in touch with farmers of the State by means of press bulletins giving recommendations arising from the work of the station as it progresses.

Experiments in the eradication of weeds in grain fields have been undertaken on a plan more extensive than heretofore. Field demonstrations have been conducted at 6 different points in the State on fields of from 50 to 100 acres each, special attention being given to a study of the machinery most suitable for applying solutions. Several new chemicals have been tested, but so far as iron sulphate and copper sulphate are concerned, no material deviation has been noted from the principles enunciated from the original investigations of the station.

Ohio University.—Ten-week winter courses, to begin January 6, 1908, are announced in the breeding and feeding of live stock, stock judging, soil fertility, farm crops, horticulture, farm mechanics, farm management, dairying, veterinary medicine, and poultry husbandry.

Rhode Island Station.—B. L. Hartwell, formerly associate chemist, has been made chemist. H. S. Hammond, assistant chemist, has resigned to accept a position at the Macdonald Agricultural College.

Vermont University and Station.—Morrill Hall, the new agricultural building now in course of construction, will be dedicated on December 11 at the time of the meeting in Burlington of the State grange.

Virginia Station.—Recent appointments include Lyman Carrier as agronomist, and F. D. Harmon as herdsman.

Washington College and Station.—H. B. Barry, a graduate of the college and last year a postgraduate student at the University of Illinois, has been appointed soil physicist in the station and will devote his entire time to studies of soil-moisture problems. R. S. Northrop, whose appointment as superintendent of the Puyallup substation was noted in a previous issue, has decided to remain with the Utah College and Station.

The station has adopted the plan of issuing a series of popular bulletins, giving concise summarized statements of the results of experiments for wide distribution among the farmers of the State. For this purpose the mailing list is being largely increased. Larger bulletins, giving full details of experimental data, will still be issued for distribution to other station workers and to interested parties who may request them.

A four years' investigation of methods of combating the codling moth has just been successfully completed, with the result that in 4 large orchards, located in different sections of this State, aggregating 80 acres of trees, an average of 99.6 per cent of fruit free from worms was obtained this year.

A wing of a new veterinary building to be used jointly by the college and station is in process of erection. The contracts have been let for a new farm barn to cost $7,000, on which work will begin at once. The new recitation building to cost $125,000, the library and assembly hall to cost $135,000, and the domestic science building to cost $25,000, provided for the college by the last legislature, are now in process of erection.

A series of traveling dairy schools is to be conducted by the extension bureau of the college, work being carried on for 10 days in each locality visited.

West Virginia University and Station.—At the recent meeting of the State Board of Trade at Elkins, Director J. H. Stewart presented a report for the committee on agriculture on the agricultural conditions and needs of the State. station is in process of erection. The contracts have been let for a new farm President D. B. Purinton and D. W. Working were also among the speakers. T. C. Johnson, assistant professor of horticulture and botany, has resigned to accept the management of the Virginia Truck Experiment Station at Norfolk. This station was established the past season for the purpose of studying the trucking industry. It is maintained from funds of the State Board of Agriculture, the local community providing the land and equipment.

Wisconsin University.—L. E. Reber, dean of the school of engineering of the Pennsylvania College, has been elected director of extension work. This will consist of lectures and correspondence for all courses of study in the university, for which university credits toward graduation will be allowed, subject to a regulation prescribing a 2-year minimum of resident study at the university.

Louise Johns has been appointed instructor in soils, and J. F. Reubensaal instructor in pasteurizing.

Association of Official Agricultural Chemists.—The twenty-fourth annual convention of this association was held at the Jamestown Exposition, Norfolk, Va., October 9–11, with about 100 delegates and visitors in attendance.

The presidential address by J. P. Street, of the Connecticut State Station, dealt especially with suggestions for the improvement of the efficiency of the work of the association. Attention was directed to some of the unsolved problems confronting the association, such as the question of the availability of potash in various forms and of basic slag, the provision of additional methods in the analysis of food and drugs, and the need for further differentiation of the constituents of the nitrogen-free extract of feeding stuffs. As a means of securing greater opportunity for the discussion of papers, a radical change in the meetings was suggested and later adopted. In the future one day of the convention is to be devoted entirely to the reading of papers and their discussion, the convention being divided for this purpose into three sections covering the same subjects as the present committees on recommendations. All papers to be read in these sectional meetings are to be referred in advance to the proper committee with full power to reject them or to assign places for them in the programme.

A second recommendation of the president suggested the appointment of a permanent committee on methods as a means of securing greater uniformity in the form of expression and arrangement from year to year. The association decided to establish such a committee on recommendations, to consist of 9 members to be elected in 1908, 3 to serve for 6 years, 3 for 4 years, and 3 for 2 years, the respective terms to be filled at their expiration for periods of 6 years. From this committee are to be organized 3 subcommittees corresponding to the present committees A, B, and C, to whom all recommendations of new methods or of changes in methods are to be submitted at least 3 weeks prior to the meeting of the association.

A further recommendation of the president, extending membership in the association to delegates from Canada and Mexico, was favorably reported, but final action on the constitutional amendments involved was deferred until the next meeting. A recommendation limiting the appointment of referees to official analytical chemists was adopted.

Resolutions were adopted in commemoration of the life and work of the late Dr. G. C. Caldwell and of Prof. W. O. Atwater, expressing the appreciation of the association of the fundamental work which they had performed as pioneers in agricultural chemistry.

The association also adopted a resolution favoring the holding of an international conference of chemists and others connected with food and drug control and with the administration of laws relating thereto, for the purpose of securing uniformity in methods.

The subject of food adulteration was, as usual, a prominent feature of the programme. E. F. Ladd submitted a paper by J. Hortvet on the examination of colors used in foods or natural to foods, and a paper by E. Gudeman on the solubilities of food colors. C. H. Jones, associate referee on saccharine products, reported that the work on this subject during the year had been confined to his personal examination of maple products of the crop of 1907.

A. McGill made a preliminary report on cereal products and E. M. Bailey submitted three methods as provisional for the analyses of cocoa and chocolate. A paper by H. L. Harris discussed legislation on preservatives in foods, with special reference to boron compounds. C. B. Cochran presented an outline for the classification of the coal-tar colors soluble in water, and W. D. Horne a method for the determination of moisture in sirup and molasses. C. A. Crampton and L. M. Tolman submitted a paper entitled A Study of the Changes Taking Place in Whiskies Stored in Wood, and G. E. Patrick a paper on the detection of thickeners in ice cream.

F. C. Weber, associate referee on the determination of water in foods, reported investigations comparing drying in a vacuum with 0.5 mm. mercury with drying in an oven with partial vacuum at 100°. T. J. Bryan submitted a paper on the carbon dioxid value of compressed yeast and of compounds of compressed yeast and starch.

The referee on nitrogen, C. L. Penny, reported cooperative work by 53 analysts in a comparison of methods of determining total nitrogen. F. C. Cook, associate referee, presented a report of cooperative work on the separation of meat proteids, and H. Snyder a report on the separation of vegetable proteids.

F. W. Woll, referee on dairy products, reported the continuation of the study of analysis of condensed milk, with special reference to the determination of lactose, sucrose, and fat in the sweetened product, considerable cooperative work being undertaken. G. E. Patrick presented two methods for cheese analysis. Feeding stuffs were reported upon by J. K. Haywood, and sugar by C. A. Browne. The work on sugar, much of which was cooperative, dealt chiefly with the analysis of dextrin and a comparison of methods for the estimation of glucose in honey. Papers were also presented on sugar and molasses by Doctor Browne and J. E. Halligan, by A. H. Bryan on the effect of hydrosulphite and rongalite on the polarization of dextrose, levulose, and sucrose, and by Fritz Zerban and W. P. Naquin on the determination of sulphurous acid in molasses.

The work on medicinal plants and drugs, submitted by the referee, L. F. Kebler, had been extended to methods for the assay of aconite leaves and root, belladonna leaves and root, cinchona bark, cocoa leaves, and colchicum crowns and seeds. F. P. Veitch, referee on tannin, reported that the work had been confined to a comparative study of the filtration of soluble solids through folded filter papers of high and ordinary grades. Cooperative work on soils was reported by the referee, J. H. Pettit, mainly in continuation of that undertaken the previous year.

The referee on inorganic plant constituents, W. W. Skinner, reported results in comparison of the determination of total sulphur by the peroxid and combustion methods. G. S. Fraps presented results obtained at the Texas Station in the study of the phosphoric acid of the soil.

The report of the referee on phosphoric acid, B. W. Kilgore, dealt with the determination of basic slag. A paper entitled Preliminary Studies on the Analysis of Basic Slag for Available Phosphoric Acid was also presented by H. D. Haskins. The associate referee, J. M. McCandless, reported results of cooperative investigations on methods for determining iron and aluminum in phosphatic rock.

A. L. Kniseley, referee on potash, and B. B. Ross, associate referee, reported that work had been restricted to a study of the volumetric method for determining potash. R. J. Davidson, referee on insecticides, submitted a report on methods for London purple, soda lime, formaldehyde, sulphur in sulphur dips, and lead arsenate. L. F. Kebler reported for the committee on testing chemical reagents, and William Frear for that on food standards.

A report on the president's address of the preceding year was presented by L. L. Van Slyke for the committee to which it had been referred, and adopted by the association.

The committee on fertilizer legislation recommended, through H. W. Wiley, that no action be taken at present toward attempting to obtain the enactment of a national fertilizer law, but that efforts be directed toward securing an agreement among State officials as to the fundamental definitions of misbranding and adulteration and as to the proper method of tagging, branding, and stating the results of analysis. Tentative definitions of these terms were submitted. It was further recommended that an attempt be made to secure agreement between the State officials and the manufacturers as to the method of referring to the crude sources of plant food in fertilizers, and that the committee be continued for this purpose with instructions to perfect, if possible, a measure satisfactory to the interests involved.

L. M. Tolman submitted a report from the committee on revision of methods. The methods as revised and compiled had been printed as Bulletin 107 of the Bureau of Chemistry, distributed to referees and others prior to the meeting, and further edited as the result of suggestions received. The methods as published in the bulletin with these corrections were adopted by the association as official and provisional. The committee was continued and further empowered to make such changes during the year as were deemed necessary, subject to the approval of the executive committee. At the expiration of the year this power is to be lodged with the new permanent committee on recommendations.

The committee on unification of terms recommended that the nomenclature now in use for fertilizers, soils, ash, etc., be retained, but that the association vote upon the advisability of permitting the use of a dual system of nomenclature when desirable, with a view to the ultimate adoption of the element system. After considerable discussion a resolution was adopted approving the attitude of the committee toward the ultimate adoption of the element system, but expressing the belief of the association that no State should discontinue the use of the terms now in vogue until the discontinuation had been approved by the association. The appointment of a committee was authorized for bringing the question of the use of the element system before the next International Congress of Applied Chemistry, with a view to securing international agreement.

Officers for the ensuing year were elected as follows: President, H. Snyder, St. Anthony Park, Minn.; vice-president, W. D. Bigelow, and secretary, H. W. Wiley, Washington, D. C.; and additional members of the executive committee, B. B. Ross, Auburn, Ala., and G. S. Fraps, College Station, Tex.

American Association of Farmers' Institute Workers.—The twelfth annual meeting of this association was held at the National Hotel, Washington, D. C., October 23 and 24. There were 131 delegates present, representing 25 States and Territories and 4 of the provinces of Canada. The convention was opened with addresses by Hon. W. M. Hays, Assistant Secretary of Agriculture, and Dr. A. C. True, of this Office.

The president, E. A. Burnett, of the Nebraska University and Station, called attention in the annual address to the importance of reviving the "artisan" spirit among farming people, and referred to the value of local organization in institute work as a means of increasing and maintaining interest by the community in rural betterment. He noted the constantly increasing difficulty in getting a sufficient number of capable institute lecturers, and referred to the establishment of movable schools as a partial remedy, in that it would provide employment for lecturers throughout the year. Federal aid he deemed of much value in helping to unify the institute systems of the different States and in collecting and disseminating information. In his opinion a material service could be rendered by the National Government in furnishing speakers for institutes, in introducing and trying out some of the newer ideas, like the traveling institute school and other forms of extension work, and making known the investigation work of this Department.

Reports were read from 25 States and Territories and 6 of the Canadian provinces. That of the Farmers' Institute Specialist of this Department showed that during the year ended June 30, 1907, 11,448 sessions of institutes had been held in the United States, with an attendance of 1,592,202 persons. Twenty-six States reported special meetings, attended by 104,224, and 6 State directors ran railroad specials, meeting 51,505 persons, making a total for the United States in attendance upon the institutes during the year of 1,747,931. The appropriation for institute purposes was $285,950. No institutes were held in Alaska, Nevada, Porto Rico, and Texas.

Reports were presented from each of the 6 standing committees of the association, and there were also papers and discussions upon the traveling library, the field institute, monthly meetings, field demonstration work, introducing courses of study in agriculture into the institute, the woman lecturer, and the annual report.

A resolution was adopted indorsing the work already done in forwarding the interests of farmers' institutes by this Department through the Farmers' Institute Specialist. The executive committee of the association was directed to confer with the Secretary of Agriculture and this Office relative to the needs of this work and to urge upon the incoming Congress the appropriation of a sum sufficient to enable the Department to develop it adequately.

The term of office of the standing committees was extended to three years, one member to be elected each year. This will make available the services of the members through a longer period and is expected to increase the efficiency of the committees. The officers of the association for the ensuing year are:

President, Dr. Tait Butler, Raleigh, N. C.; vice-president, J. L. Ellsworth, Boston, Mass.; secretary-treasurer, John Hamilton, Washington, D. C.; and the executive committee: The president and the secretary ex-officio; G. A. Putnam, Toronto, Ontario; T. L. Calvert, Columbus, Ohio, and A. E. Chamberlain, Brookings, S. Dak.

National Corn Exposition.—The first National Corn Exposition was held in Chicago October 5–19. About 5,000 exhibits of corn were shown, representing nearly every State as well as Canada. Although the attendance was somewhat disappointing, from an educational point of view the exposition was considered extremely successful. An intercollegiate match in corn judging was participated in by teams of students from the Iowa and Kansas colleges, the first prize of $200 being awarded to the Iowa College.

During the exposition a National Corn Growers' Association was organized for the purposes of encouraging the improvement of corn by breeding, disseminating information regarding the best methods of soil culture and farm management for corn, encouraging the holding of a national corn exposition annually by stimulating interest in corn culture in undeveloped territory, unifying methods and standards of corn judging so far as possible, securing the adoption of uniform classification for corn exhibits and rules governing exhibits, encouraging the development and uses of corn products, and opening up home and foreign markets through education regarding the use of Indian corn and corn products as food for man and beast.

National Dairy Show.—The National Dairy Show was held in Chicago October 10–19, with exhibits of about 600 cattle representing 6 breeds from 13 States and Canada. The exhibits of butter and of dairy machinery were also especially good. Director M. A. Scovell, of the Kentucky Station, served as judge in the Ayrshire class, and the programme included papers and addresses by E. H. Webster and C. E. Gray, of the Dairy Division of this Department; Oscar Erf of Ohio State University, G. H. Benkendorf of the Wisconsin University and Station, G. L. McKay and H. G. Van Pelt of the Iowa College and Station, J. W. Fraser of the Illinois University and Station, T. L. Haecker of the Minnesota University and Station, and H. H. Dean of the Ontario College and Station.

In connection with the show the second annual meeting of the National Association of Dairy Instructors and Investigators was held, with representatives of 10 States in attendance. An address was delivered by the president and reports received from committees on the dairy score card, official testing of dairy cows, the relation of the association to the National Dairy Show, courses of instruction, and experimental work in production and manufacture. Additional committees were appointed on official tests, standards for dairy products, cooperative work, and the formation of a cow test association.

The former officers were reelected as follows: R. A. Pearson, of Cornell University, president; Oscar Erf, of Ohio State University, vice-president, and C. B. Lane, of the Dairy Division, secretary and treasurer. The next meeting is to be held at Cornell University next summer in connection with the Graduate School of Agriculture.

Agricultural Departments in India.—An account of the work accomplished during 1906–7 in reorganizing and developing agricultural departments and educational and research institutions in India is published in *The Agricultural Journal of India* for July. It appears that the Imperial Department has engaged in training a number of men to take up responsible posts in the different provinces, that the provincial departments have made good progress toward organizing separate departments of agriculture, and that a decided advance has been made in the acquisition of material equipment.

The Agricultural Research Institute at Pusa is approaching completion and its laboratories will probably be occupied during the current year. In each province the site for a provincial college and research station has been selected, and in many cases considerable progress has been made in erecting buildings and laying out the land. The plans contemplate eight provincial colleges and experiment stations in addition to the Imperial Research Institute, besides a large number of experimental and demonstration farms. There has been delay in inaugurating field experiments at Pusa owing to the necessity of carrying on some uniform crop work for several seasons to obtain a knowledge of the character of the soil. Departments of chemistry, botany, entomology, and mycology have been organized, and in each of these some preliminary research work has been started.

Institute for Milling Research.—An institute for milling research was opened July 30 in the Seestrasse, Berlin, adjoining the present institutes for research in the sugar and fermentation industries. The institute consists of a main building with administrative offices and laboratories, an experimental granary, wheat and rye mills, and a bakery. The mills are equipped with electrical power and the most modern machinery throughout, with duplicate plants, each capable of milling 2 tons of grain per day. The bakery and granary are similarly well fitted up.

A grant of $150,000 from the minister of agriculture was available for the establishment of the institute, besides an annual grant for its maintenance. The institute is to be in charge of the Prussian Chamber of Agriculture, the German Millers' Union, and the Central Bakery Union of Berlin. It will be devoted to practical research and scientific investigations on grain during storing, milling, and baking, experiments in the baking of home-grown and imported grain, other research work for the government, and official and private analyses of grain, feedstuffs, etc.

Royal Hungarian Agricultural Museum at Budapest.—Three large exposition buildings in Budapest have recently been converted into an agricultural museum, which was opened June 9. This is one of the four large agricultural museums, comparing favorably with those at Berlin, Rome, and St. Petersburg.

New Journals.—The establishment is noted of *Southern Woodlands*, a bimonthly published by the Georgia Forest Association, with Alfred Akerman, the State forester, as editor. The initial number contains, besides brief editorial notes, the addresses of Mr. Akerman and Alfred Gaskill of the Forest Service of this Department, at the inauguration of a department of forestry in the University of Georgia.

Cornell University has discontinued the *Junior Naturalist Monthly* and is issuing the *Cornell Rural School Leaflet*. An explanation of the change is given in an article by L. H. Bailey, in which it is stated that the College of Agriculture has "always had in view the agricultural aim or application" of nature study, but that it was thought necessary first to prepare the way by encouraging work in the schools which would lead to "nature-sympathy," which "is fundamental to all good farming" and should go before any study of "the specific agricultural phases of the environment." The *Cornell Rural School Leaflet* will be published monthly under the editorship of Alice G. McCloskey, with Profs. G. F. Warren and Charles H. Tuck as advisors. The initial number contains, in addition to Director Bailey's article, a paper on Nature Study Agriculture, by Miss McCloskey, and suggestions as to equipment for teaching elementary agriculture, by Professor Warren.

The *Quarterly Journal of the Department of Agriculture, Bengal*, is being published under orders of the government of Bengal. It is stated to be intended primarily for members of the several local agricultural associations and for such members of the landholding and farming classes as take a personal interest in agricultural matters. The initial number contains reprints of department publications, extracts from other journals, and short notes on a variety of agricultural crops and allied topics.

Miscellaneous.—Dr. G. Hellmann has been appointed professor of meteorology in the University of Berlin and director of the Prussian Meteorological Service in succession to the late von Bezold.

Wiener Landwirtschaftliche Zeitung announces the retirement on account of ill health of Dr. C. Fruwirth, of the Royal Agricultural High School of Würtemberg.

Dr. Gustavo d'Utra, former director of the Agronomic Institute at São Paulo, Brazil, has been reappointed to that position and given a commission to travel in Europe and the United States for the purpose of studying the institutions devoted to agricultural education.

Deutsche Landwirtschaftliche Presse notes the resignation of P. Peterson as director of the Experiment and Control Station at Oldenburg-on-the-Main. Dr. F. Honcamp has been appointed his successor.

The National School of Agriculture, formerly located at San Jacinto, Mexico, is to be removed to a new site near the City of Mexico, where sufficient land will be provided for the use of the school and also for experimental purposes, and where suitable buildings will be erected. The control of the school has recently been transferred from the Department of the Interior to the Department of Public Instruction and the Fine Arts.

Dr. Albert E. Leach, chief analyst of the Massachusetts State Board of Health, has accepted the position of chief of the new food inspection laboratory established by the Bureau of Chemistry of this Department at Denver.

The administration building of the meteorological observatory of the Weather Bureau, at Mount Weather, Va., was burned October 23. The loss approximates $25,000, including some valuable instruments.

J. E. Roadhouse, a graduate of the University of California, a postgraduate student at Cornell University, and at present connected with the irrigation investigations of this Office, has been elected dean of faculty for the newly organized Hawaiian College of Agriculture and Mechanic Arts. It is expected that he will enter upon his duties about January 1, 1908. The last territorial legislature appropriated $25,000 for a building and for maintenance for two years. A preparatory class is to be organized next spring, and the opening of the college is planned to take place in the fall.

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EXPERIMENT STATION RECORD.

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The subject of the oral instruction of the farmer is commanding increased attention. It is new only in the wider scope which is being given it, and the more systematic form proposed. Already there is a widespread belief that the average man on his farm must be reached in some way if the work of the experiment stations and similar agencies is to be made fully effective. This means the living teacher, meeting him on his own ground and appealing to his practical sense by illustration and demonstration. It is a logical development of the various efforts now being made for a more rational and progressive agriculture.

A vast amount of investigation and experimentation in the different branches of agriculture is now in progress in this country. However technical some of it may appear to be in its abstract form, it is all directed ultimately toward utilitarian ends. It is intended to aid the practical farmer of to-day, as well as the prospective farmer or specialist who is studying the theory and its application. One of its most far-reaching objects is to leaven the whole mass of farmers, so that agriculture as a whole shall become a really progressive industry, carried on by well-informed and progressive men.

The accomplishment of this end is a peculiarly difficult task. The experiment stations go on collecting data which are well-nigh unbelievable as reflecting conditions of farm practice, and display much ingenuity in presenting these facts in such way as to arouse those laboring under them. They show, for example, that one-fourth of the cows in a great dairy section are profitless and should be sold to the butcher, that the average yield of great staple crops is only one-third to one-half what it should be, that soils are steadily being worn out by irrational and improvident methods, that farmers are paying large sums for patented stock feeds which they might better mix themselves, that the quality and value of fruit is greatly reduced by failure to spray, and a long list of other facts equally important to the farmer from a business point of view. But it is only as these things are brought home to the individual farmer that the teachings are applied in anything like a general way. The difficulty is to reach the large body of men effectively through the printed word.

The trouble is not that we have too little work which is on a practical basis, but that the results never reach the large body of farmers in such a way as to influence their practice. The condition is much the same the country over. Although the farmers of some classes and in some sections are more progressive and less conservative than in others, the need is generally apparent of a much more efficient means than we yet have of getting at the practical farmers through the living teacher, and thus placing them in position to profit by the results which are being secured in their interest.

A strong plea for the instruction of the great body of farmers was made by Prof. E. A. Burnett in his presidential address before the recent convention of Farmers' Institute Workers. He declared that "education upon the farm, as elsewhere, is more and more necessary if the farmer is to keep abreast with the progress of this generation, and if the rural community is to furnish the incentive for progress in country life. Agricultural progress demands, not alone that a few in a county or a township shall be successful farmers, but that every man and woman who lives out on the land shall be efficient and successful in his particular vocation."

To this end he laid special emphasis on relating the institute work to "the common man who is located upon the small farm with a limited capital and without special advantages of education," for he is the man who needs help along agricultural lines more than any other man. To him the question of profit appeals especially, and he needs to be shown how he can improve his financial condition through the use of methods which have been wrought out by successful farmers and by the experiment stations. There is no other agency now at work, he declared, which can reach this average man like the farmers' institute. "The presentation of the work of the experiment stations through bulletins and the agricultural press is effective in reaching a limited number of the intelligent class of farmers, but the promotion of any new idea, to be effective, requires a living advocate before the people."

There is much truth in this, and the "living advocate" has been the main strength of the farmers' institute. The scope of its teachings and influence, it was urged, should include all that pertains to the farmer's life as well as to his vocation—the improvement of home surroundings, construction of convenient and sanitary houses and barns, education of his children, and the development of the social life of the country. The influence which may be exerted by personal contact in arousing interest and stimulating pride in these matters was believed to be very potent. "The establishment of a well-ordered farm is generally not so much a matter of money expenditure as of sympathetic thought and discussion on these subjects."

Last year more than eleven thousand farmers' institute sessions were held in the several States of the Union, which were attended by approximately a million and a half people. More than a quarter of a million dollars annually is now expended in this line of work. These facts indicate the present extent of this movement.

But while the farmers' institute is an effective means of reaching the farmer as far as it goes, it has serious limitations in its present form. One of these is the short institute season, which makes it difficult to secure good workers. Professor Burnett urged that this campaign for the instruction of the farmers should continue throughout the year, and should be expanded into some form of extension work which would employ a body of trained men, whose work would include the carrying on of short courses in localities where they could be easily reached by the farmers. Such local short courses have been tried in a few States with marked success, and plans for movable schools have been presented by the institute specialist of this Office. More experiments of this kind will be made the present season.

Another phase of this practical assistance to the man in the field is that relating to new settlers. These constitute a special class whose needs are of a different kind from those of the established farmers. In a country like ours they are a class to be taken account of in a comprehensive scheme of oral or individual instruction.

There is a constant movement of people from the older settled parts of the country to the North, the South, and the West, to occupy new lands and assist in the development of new territory. These people come into a new environment which presents entirely different phases of farming from those to which they have been accustomed. Much can be done to assist them in conquering these new conditions and establishing prosperous farms. Aside from these, more than a million immigrants are now being brought to our shores annually, many of whom seek homes on the newer lands where the crops, the culture, and the system of management are entirely strange to them. How are the needs of these people to be met, and how is this influx to be made more efficient?

In a recent address before the National Irrigation Congress, Prof. Samuel Fortier presented figures showing that next year (1908) there will be thrown open to settlement in the irrigated region of this country about five million acres of unimproved land. Its occupation will mean one hundred thousand new settlers with their families, and to them will be presented the problem of preparing the desert for irrigation, the construction of ditches, selection and planting of crops, and proper cultivation and irrigation. Before any harvest can be obtained on this new land it will cost, on an average, over $20 an acre. The heaviest expense will come at a time when there is little or no income, and hence mistakes or bad management need especially to be avoided.

Professor Fortier argued that "if it is right and proper to employ the best engineering talent to design and supervise irrigation structures, the same necessity exists to employ men of equal skill to supervise that part which belongs to the agricultural side of irrigation;" and that from this point of view "fully a thousand skilled men could be profitably employed under the more recently built irrigation systems." These men should be familiar with both the practical and scientific phases of irrigation farming, and competent to advise in the work of converting a desert into a productive irrigated farm.

This is a matter which concerns all parties interested—the canal companies, the communities, the States, and the Federal Government, which has become a party through its reclamation work. The success or failure of these settlers in developing their lands and establishing comfortable and prosperous homes will mean the temporary success or failure of the new communities and of the irrigation systems under which they are located. "The conversion of $5 grazing land into $100 alfalfa land and $500 orchards is of vital interest to every western commonwealth, and each can afford liberal appropriations to help to produce such changes. Reliance must also be placed on Western States and Territories to maintain in the highest state of efficiency the irrigation work of western experiment stations."

Several of the Western States are extending various forms of assistance to both arid and irrigation farming, aside from the strictly experimental work they are doing. This work, with the assistance which the National Department of Agriculture is giving it, has proved extremely helpful. It does not, however, reach the individual settler except in a quite restricted way. The work for new settlers is not confined to the irrigated West. The South is inviting immigration and the conditions there present special problems.

These forms of extension work are essentially educational in character. As such they touch the work of the college on the one hand and of the experiment station on the other, but they do not fall directly within the scope of either agency, which already has its special duties. The work constitutes a separate branch of effort which stands between the station and the college, and supplements and extends the influence of both. Its duties require a special force of men who are not tied down by experimental work or a teaching schedule. In the present organization the experimental, the instructional, and the extension branches each have their own special field and functions which may be quite definitely defined.

The brunt of this outside work has hitherto fallen very largely upon the experiment stations. The organization of extension departments will greatly relieve them of this burden and allow them to confine themselves more strictly to their legitimate fields. The station should disseminate, not general information, but the results of its experiments and investigations; and its efforts in that direction will necessarily be confined for the most part to the usual channels of its bulletins and reports. The popular instruction of the farmer, on the other hand, does not stop with what is strictly new, but begins with what is new to him, and attempts to prepare him to profit by the work of the station.

The station men have of late been relieved to considerable extent of the institute work. This must necessarily be the case, and they can be expected to do less and less of this outside work. While a limited amount is often helpful in keeping them in close touch with the farmers' problems, this amount can easily pass beyond the boundaries of desirability. The correspondence of the station men is still, in many instances, very heavy and burdensome. It consists in large measure of answers to practical questions from farmers on a great variety of topics, and has often been made quite a feature. In some instances as many as three thousand letters a year have been answered by a single department of the station. These, if given conscientious attention, make large inroads upon the men's time and only incidentally and occasionally are of assistance to them in their work. Thousands of letters in reply to popular inquiries have been written out laboriously by the investigators themselves, because of the lack of stenographic assistance.

This has all been a part of a general propaganda for a more intelligent and progressive agriculture, and aside from its direct assistance has been of immense value in winning the confidence and support of the farmers and developing public sentiment. But this movement is now so thoroughly set in motion, the consulting expert and the bureau of information may well be turned over to a special agency. The aim should be to differentiate between these different classes of effort as rapidly as possible, and to conserve the time of the station men for the experimental work which is now demanding their full attention. This furnishes the foundation and is the mainstay of both the college instruction and the extension work.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

The corrosion of iron, A. S. Cushman (*U. S. Dept. Agr., Office Pub. Roads Bul. 30, pp. 35, pls. 7, figs. 3*).—Some method of rendering the metal used for culverts, fence wire, and other purposes more resistant to corrosion would be of immense importance to agriculture. In the search for this, knowledge of the causes of corrosion is fundamental. The author discusses the carbonic-acid theory, the peroxid theory, and the electrolytic theory of corrosion, with experimental evidence against and in support of them.

In his opinion the electrolytic theory most satisfactorily explains the phenomenon of corrosion of iron. According to this theory rusting of iron must take place with the establishment of positive and negative spots. At the positive points iron will pass into solution and be oxidized to colloidal hydroxid form, which will migrate toward the negative point. The electro-chemical action was demonstrated by treating iron and steel with a specially prepared reagent, containing phenolphthalein, which marks the hydroxyl ions by red color at the negative points, and a trace of potassium ferricyanid, which marks the ferrous ions at the positive points by the formation of Turnbull's blue. To prevent diffusion and preserve the effects produced the reagent was prepared with gelatin, and the pieces of metal were embedded in the jelly.

Two ways by which questions attendant upon rapid corrosion may be met are suggested. One is by the manufacture of better metal, and the other by the use of inhibitors and protective coverings. Laboratory tests with the latter apparently indicate that chromic acid with its salts may, under certain circumstances, be used to inhibit extremely rapid corrosion by electrolysis.

Report on colors: The solubility and extraction of colors and the color reactions of dyed fiber and of aqueous and sulphuric-acid solutions, H. M. Loomis (*U. S. Dept. Agr., Bur. Chem. Circ. 35, pp. 51*).—The results are given of tests with a large number of coloring matters, the data being of value especially in connection with studies of coloring materials in foodstuffs and methods for their detection.

The heat of combustion of vegetable proteins, F. G. Benedict and T. B. Osborne (*Jour. Biol. Chem., 3 (1907), No. 2, pp. 119–133*).—Elementary analyses and determinations of the heat of combustion of a number of vegetable proteins are reported.

The smallest values, 5.358 and 5.359 calories per gram, were found respectively with wheat globulin and with conglutin from yellow lupine, and the highest value, 5.916 calories per gram, with hordein. In general, higher heats of combustion were observed in the materials examined which, the authors and with those having a lower oxygen content. Many irregularities in heat of combustion were observed in the materials examined which, the authors believe, are due to different proportions of the various amino acids which constitute the molecules of the different proteins. "As we have but little knowledge of the relative proportions of these amino acids in the proteins burned, we are not able yet to draw any definite conclusions in regard to these differences."

Changes in the index of refraction of glucosids and proteids induced by ferments, acids and bacteria, F. OBERMAYER and E. P. PICK (*Beitr. Chem. Physiol. u. Path., 7 (1905), pp. 331-380; abs. in Hyg. Rundschau., 17 (1907), No. 9, p. 553*).—Experiments undertaken by the authors showed that determining the refractive index of glucosids and proteids afforded a satisfactory method of studying the molecular changes brought about by cleavage agents.

Sucrase in apple pomace and cider, G. WARCOLLIER (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 18, pp. 987-990*).—Experimental data showed, in the author's opinion, that sucrase is not present in apple pomace and that pomace rich in saccharose ferments as rapidly as that which contains small quantities. The inversion of saccharose in cider is brought about by the sucrase of yeast.

The determination of nitrates by the Busch method, R. ADAN (*Bul. Soc. Chim. Belg., 21 (1907), No. 6, pp. 229-233; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 538, II, pp. 651, 652*).—The method of determining nitrates by precipitation with nitron is described and tests of the method on various samples of nitrate are reported. The results obtained by this method agreed closely with the calculated percentages. Studies of the solubility of the nitron precipitate are also reported, solubilities of from 1.35 to 2.23 per cent, as a result of prolonged washing, being found. The presence of nitrites was found to be a serious source of plus error. It is stated that a great obstacle to the general use of the method is the high price of the reagent.

On methods of determining soluble phosphoric acid in slag, E. JENTYS (*Sur les Méthodes de Dosage de l'Acide Phosphorique Soluble dans les Scories. Cracow: Imprimerie de l'Université Jagellone, pp. 27*).—The author discusses sources of error in the citric-acid method without separation of silica, as proposed by Wagner, and with separation of silica, as proposed by Loges, and reports comparative tests of these methods on 388 samples of slag of different kinds. He found that the Loges method gave uniformly lower results than the Wagner method, the average difference for all of the samples examined being 0.25 per cent. The conclusion is reached that neither of the methods is entirely satisfactory.

Methods of analysis and tests used by the chemists, P. A. YODER (*Utah Sta. Bul. 102, pp. 229-237*).—Methods of treating air samples and determining the carbon dioxid and moisture content are described, which were used in the incubation experiments noted elsewhere (p. 368).

The determination of creatin and creatinin, F. G. BENEDICT and V. C. MYERS (*Amer. Jour. Physiol., 18 (1907), No. 4, pp. 397-405*).—But little regularity can be observed in the properties of creatin and creatinin in human urine.

According to the authors' deductions from the experimental data reported, "in general the conversion of creatinin to creatin seems to be due to chemical action, or possibly to the action of enzyms in the urine. When a urine is allowed to stand, alkaline fermentation takes place, and the creatinin sooner or later almost completely disappears. Furthermore, the evidence from alkaline urines is not conclusive to show that creatin is an intermediate product. The conversion of creatinin to creatin even in the presence of chloroform and thymol shows that this conversion is not a bacteriological process. It is obvious that much experimenting must be carried out before the problem is wholly clarified. In general it would appear that there is more likely to be a complete loss of creatinin in a urine that is alkaline. Whatever the cause of the conversion of creatinin to creatin, in any determination of either of these compounds, a factor which must never be left out of consideration is that of the influence of bacteria. Consequently emphasis can not be too strongly laid upon the importance of making determinations of creatin and creatinin in urine as soon as possible after it has been voided. A preservative may delay action, but accuracy demands immediate analysis.

"Chloroform is unsatisfactory as a preservative, and even the use of thymol-chloroform does not insure the absence of the conversion of creatinin to creatin, or indeed the loss of creatinin, although all the samples of urine constantly gave an acid reaction."

Methods for the determination of creatin and creatinin in meats and their products, H. S. Grindley and H. S. Woods (*Chem. News, 95 (1907), No. 2470, pp. 145-147*). The data reported have been noted from another publication (E. S. R., 18, p. 812).

The identification of soap in zwieback, F. Schwarz and L. Hartwig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 10 pp. 593–598*).—As zwieback extract containing soap is sometimes used in the manufacture of adulterated zwieback, the authors studied the possibilities of determining small amounts of soap in such goods.

Small quantities of unsaponified soap, they conclude, may be best extracted by means of absolute alcohol. If dilute alcohol is used, bread acids are also removed which saponify the soap. The small amount of soap used in zwieback manufacture is in general broken down into alkali and free acid by fermentation or baking processes and is not recognizable as soap in the zwieback. Goods made with extract containing soap show more alkali in the ash and more free acids soluble in alcohol and ether than ordinary zwieback. Of course the use of zwieback extract which contained potash or butter of high acid content would also affect these factors.

Identification of sodium benzoate or phosphate in the ash of chopped meat, A. Beythien (*Pharm. Centralhalle, 48 (1907), p. 122; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 10, p. 648*).—Although the sodium content of the ash was increased, the author believes that the natural variations are so great that the determination of this value will not serve for the detection of added sodium benzoate or phosphate.

Reply to criticisms of dry lead defecation in raw sugar analysis, W. D. Horne (*Jour. Amer. Chem. Soc., 29 (1907), No. 6, pp. 926–929*).—A controversial article.

The use of cryoscopy in judging of spices and other drugs, E. Beckmann (*Arch. Pharm., 245 (1907), No. 3, pp. 211–234, figs. 6*).—According to the experimental data summarized, cryoscopic methods may be of importance in judging of the quality of spices and other drugs. The data summarized also discuss the use of such methods in the estimation of fat in milk, cheese, and other foods.

The rapid estimation of total solids in milk, C. Revis (*Analyst, 32 (1907), No. 377, pp. 284, 285*).—One cc. of acetone is added to 2.5 gm. of milk in a flat porcelain dish which is placed on a water bath for 12 minutes and in a water oven for 2 hours.

The estimation of salicylic acid in milk and cream, C. Revis and G. A. Payne (*Analyst, 32 (1907), No. 377, pp. 286–288*).—The milk or cream is neutralized with sodium hydroxid and treated with hot alcohol. The filtrate from this is diluted with water and rendered distinctly alkaline. After a portion is distilled off, the residue is treated with potassio-mercuric iodid solution, filtered, and the filtrate extracted with ether. The ethereal extract is treated with tenth-normal sodium hydroxid and after the addition of an equivalent amount of sulphuric acid is used for the colorimetric determination of salicylic acid by the use of iron alum.

Refraction of nonvolatile fatty acids in butter, W. Ludwig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 3, pp. 208–213*).—The indices of refraction of 111 samples of butter ranged from 40 to 43.6 and of the nonvolatile fatty acids from 28.9 to 31.7.

Refraction of nonvolatile fatty acids in butter, H. Sprinkmeyer and A. Fürstenberg (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 3, pp. 213–215*).—The authors determined the indices of refraction of butter, cocoanut oil, lard, and other fats, and of the nonvolatile fatty acids contained therein. Ten samples of butter showed indices ranging from 42.8 to 45, and the nonvolatile fatty acids of the butter indices ranging from 30.8 to 33.4. Similar results were obtained with other fats. The authors do not believe that the refractometer numbers of the nonvolatile fatty acids show less variations than those of the fats

Refraction of the nonvolatile fatty acids, T. Sudendorf (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 3, pp. 216–220*).—The refractometer numbers of 56 samples of butter from various sources ranged between 40.1 and 46.3 and the numbers of the nonvolatile fatty acids of the butter between 28.7 and 34.9. Determinations were also made of the indices of refraction of cocoanut oil, lard, and tallow, and of the nonvolatile fatty acids of these fats. As a means of detecting adulterations, the author finds no advantage in determining the index of refraction of the nonvolatile fatty acids over that of the fats themselves.

A new method for the detection of cocoanut oil in butter, R. Cohn (*Ztschr. Öffentl. Chem., 13 (1907), No. 16, pp. 308–311*).—The fat is saponified as in the Reichert-Meissl method, the alcohol is evaporated, and the soap is dissolved in warm water, cooled, and treated with a saturated solution of sodium chlorid. To the clear filtrate from this is added hydrochloric acid, which causes a cloudiness if cocoanut oil was present in the original sample. The amount of cocoanut oil is indicated by the degree of cloudiness.

The new "international" method of tannin analysis (*Collegium, 1907, No. 266, pp. 249–254*).—This gives the final recommendations of the international commission appointed at the 1906 conference of the International Association of Leather Trades Chemists to investigate and make comparative tests of various methods of tannin analysis with a view of selecting the most satisfactory.

An apparatus for the determination of carbon dioxid in carbonates, P. Malherbe (*Ann. Chim. Anal., 12 (1907), No. 7, pp. 261–263, figs. 3*).—An apparatus so constructed as to obviate danger of suction of the sulphuric acid into the flask where the carbon dioxid is being disengaged is described.

The rate of combustion and pressure developed in a calorimetric bomb, F. G. Benedict and F. P. Fletcher (*Jour. Amer. Chem. Soc., 29 (1907), No. 5, pp. 739–757*).—The Berthelot-Atwater bomb calorimeter was used. In this study of the effects of different amounts of material and different initial pressures upon combustion pressure, the effect of different sized capsules and of loose and compressed material, and related factors. The authors' summary of their results follows:

"With an initial pressure of 300 lbs., the pressures in the calorimetric bomb rarely exceeded 700 lbs. The greater the quantity of material the greater the pressure, although the pressure is not proportional to the weight of the substance. The greater the initial pressure the greater the maximum pressure, although regularity and proportionality are not observed.

"The medium sized capsule used in these experiments has a distinct tendency to decrease the maximum pressure and to retard combustion. The other capsules have a much less marked but similar effect. The pellet form of material in all cases markedly decreases the maximum pressure and retards the combustion.

"The incorporation of inert material is without appreciable effect on the maximum pressure, but markedly retards the rate of combustion. Anthracite coal results in low maximum pressures, but the rate of combustion is extremely slow, sharply contrasting with results from bituminous coal."

Proceedings of the twenty-second convention of the Association of German Agricultural Experiment Stations, Stuttgart, September 15 and 16, 1906, (*Landw. Vers. Stat., 66 (1907), No. 3, pp. 169–251*).—This account contains a brief report on the work and expenditures of the association during the past year; the discussion and adoption of an amended rule requiring a unanimous vote of members present for the adoption of new methods or the change of old official methods; instructions to the fertilizing experiment section to test the difference in efficiency of the nitrogen of horn meal and bone meal and the influence of the organic matter of raw bone on the action of its phosphoric acid; a second report on investigations on sulphur for use in vineyards; on steps taken to fix the limits of variation in the composition of ammoniated superphosphates; on definition of the unallowable impurities of bran and of seeds, and the allowable percentage of sand in feeding stuffs; a paper on examinations of potash salts falling below standard grade and the adoption of a resolution declaring the so-called works analyses unreliable; a report on comparative tests by a number of experiment stations of the von Lorenz method of determining phosphoric acid, especially as applied to the determination of citric-acid-soluble phosphoric acid in Thomas slag, the convention ordering a further comparison of the method with the ordinary official methods; a report on certain misunderstandings arising in the Thomas slag trade; discussions of methods of detecting mites in feeding stuffs and of determining the purity of linseed cake; and a brief account of progress made in perfecting a method of determining fat by shaking with ether.

Various other reports on matters of organization, policy, and cooperation between agricultural organizations, etc., are also included.

Proceedings of the twenty-third annual convention of the Association of Official Agricultural Chemists, held at Washington, D. C., November 14–16, 1906, edited by H. W. WILEY (*U. S. Dept. Agr., Bur. Chem. Bul. 105, pp. 213, fig. 1*).—This is the official report of the proceedings of the convention. A summarized account of the meeting has been given (E. S. R., 18, p. 396), and a circular of the Bureau containing extracts from the proceedings noted (E. S. R., 18, p. 711).

Analyses for members during 1906, J. HENDRICK (*Trans. Highland and Agr. Soc. Scot., 5. ser., 19 (1907), pp. 145–147*).—Brief notes are reported regarding the analysis of fertilizers, feeding stuffs, and miscellaneous samples.

METEOROLOGY—WATER.

Studies on the thermodynamics of the atmosphere, F. H. BIGELOW (*U. S. Dept. Agr., Weather Bur. Doc. 372, pp. IV + 73, pls. 10, figs. 35*).—This is a series of reprints from *Monthly Weather Review* for January, February, March, June, July, August, October, November, and December, 1906, of papers discussing asymmetric cyclones and anticyclones in Europe and America; coordination of the velocity, temperature, and pressure in the cyclones and anticyclones of Europe and North America; application of the thermodynamic formula to the nonadiabatic atmosphere; numerical computations in the vertical ordinate; the horizontal convection in cyclones and anticyclones; the waterspout seen off Cottage City, Mass., in Vineyard Sound, on August 19, 1896; and the meteorological conditions associated with the Cottage City waterspout.

Meteorological Chart of the Great Lakes, A. J. HENRY and N. B. CONGER (*U. S. Dept. Agr., Weather Bur., Met. Chart Great Lakes, 1906, No. 2, pp. 12, chart 1*).—This is a summary of observations on storms and high winds in the lake region, 1906; precipitation, November, 1905–October, 1906; opening and closing of navigation, 1906; vessel passages at Detroit, Mich., during the season of navigation, and wrecks and casualties for 1906.

Meteorological Chart of the Great Lakes, A. J. HENRY and N. B. CONGER (*U. S. Dept. Agr., Weather Bur., Met. Chart Great Lakes, 1907, No. 1, pp. 29, pl. 1, chart 1.*)—This contains a summary of the average annual precipitation in the lake region and of observations on the meteorological conditions of the winter of 1906–7 in the lake region, with notes on ice on the Great Lakes during the winter of 1906–7, and display of storm warnings. Lists of stations and location of flagstaffs and steel towers, and Canadian Great Lakes storm-warning stations are also given.

Meteorological conditions at Orono, Me., J. S. STEVENS (*Univ. Maine Studies, No. 7, pp. 52, chart 1*).—This is a compilation of meteorological observations which have been carried on at Orono, Me., since January 1, 1869, including also the results of a series of special observations on precipitation and on the evaporation of snow and ice and of liquids.

Meteorological division, E. BURKE (*Montana Sta. Rpt. 1906, pp. 138–141*).—This is a record of temperature, precipitation, humidity, soil temperatures, wind velocity and direction, sunshine, cloudiness, etc., at Bozeman for the year 1906, with summaries of similar observations since January 1, 1900.

Annual precipitation in Oklahoma and Indian Territory, J. P. SLAUGHTER (*Oklahoma Sta. Rpt. 1907, pp. 60, 61*).—Tabular summaries are given of annual precipitation at various places in Oklahoma and Indian Territory during the period 1889 to 1906.

Report on meteorological observations 1906, R. H. CURTIS (*Jour. Roy. Hort. Soc. [London], 32 (1907), pp. 230–239, figs. 3*).—Observations on temperature, precipitation, wind movement, and sunshine at the garden of the Royal Horticultural Society, Wisley, during each month of the year, are summarized in notes and diagrams.

The weather of 1906 in Switzerland, R. BILLWILLER (*Schweiz. Ztschr. Forstw., 58 (1907), Nos. 2, pp. 46–54; 3, pp. 85–88*).—Monthly and annual summaries of observations on temperature, precipitation, sunshine, etc., are given for various places in Switzerland, and the general character of the weather of the year is discussed.

The unreliability of weather forecasts (*Himmel u. Erde, 19 (1907), No. 8, pp. 377–380*).—This is a critical review of an article by H. J. Klein, and tends to show that Klein's conclusions regarding the unreliability of the government weather forecasts in Germany are not well founded. The author's analysis of these forecasts during 4 months leads to the conclusion that only 10 per cent of them were bad and only one entirely wrong.

The end of weather shooting, J. M. PERNTER (*Met. Ztschr., 24 (1907), No. 3, pp. 97–102; Umschau, 11 (1907), No. 29, pp. 572–574*).—From the author's own experiments at Windisch-Feistritz and those at Castelfranco in Italy, and elsewhere, the conclusion is reached that the inefficiency of this method of protection against hail is clearly demonstrated.

Meteorology in its relation to horticulture, R. H. Curtis (*Jour. Roy. Hort. Soc. [London], 32 (1907), pp. 104–112, figs. 3*).—This is a general discussion of the meterological elements which are of most direct interest to horticulturists and the means of determining and interpreting them.

Report on the phenological observations for 1906, E. Mawley (*Quart. Jour. Roy. Met. Soc. [London], 33 (1907), No. 142, pp. 139–163, pl. 1*).—As usual in these reports the leading climatic and phenological characteristics of the different seasons of the year are described and the seasonal growth of 13 selected plants in different parts of England, Ireland, and Scotland are platted. The data used were furnished by a large number of observers throughout the United Kingdom.

The psycho-physical aspect of climate, F. Pearse (*Jour. Trop. Med. and Hyg. [London], 10 (1907), No. 14, pp. 242, 243*).—Weekly averages for 24 years of pressure, temperature, humidity, and rainfall at Calcutta are correlated with the physical sensations which the different types of weather produce.

A contribution to the climatology of the Canary Islands, O. Burchard (*Met. Ztschr., 24 (1907), No. 2, pp. 64–74, fig. 1*).—The leading climatic conditions are described with a summary of the principal meteorological data involved.

Climate of the wheat area of Central Canada (*Quart. Jour. Roy. Met. Soc. [London], 33 (1907), No. 141, p. 55*).—This is an abstract of a paper by L. W. Lyde presented at the York meeting of the British Association. It is explained in general that this area has a typical continental climate modified by latitude and lakes, a long summer day, slow rotation of earth, and chinook winds. Spring is sudden and short; summer is the rainy season, beginning with mid-May rains and ceasing with mid-August dry spell; autumn is a dry season; the winters are long and cold, but the cold is not sufficiently intense to affect the north limit of wheat in summer, although guaranteeing a cleansing of the plowed lands.

The climate of Peru, J. Hann (*Met. Ztschr., 24 (1907), No. 6, pp. 270–279*).—The climatological conditions of Peru are summarized mainly on the basis of the observations by Bailey (E. S. R., 18, p. 613) and Pickering.

The average duration of frosts on the earth, O. Dorscheid (*Met. Ztschr., 24 (1907), Nos. 1, pp. 11–24, fig. 1; 2, pp. 49–64, pl. 1*).—Data bearing on this subject from all parts of the world are summarized and discussed. A bibliography of 55 references is also given.

On the soot and smoke nuisance, M. Dennstedt and F. Hassler (*Chem. Ztg., 31 (1907), No. 43, pp. 550, 551; abs. in Chem. Zentbl., 1907, II, No. 2, p. 174*).—Analyses of 10 samples of hard-coal soot showed an average of 12.9 per cent of ammonium sulphate, the amount varying from 1.9 per cent to 26.2 per cent. The authors attribute the injurious effect of smoke and fumes mainly to the presence of free sulphuric acid.

Water resources of Georgia, B. M. and M. R. Hall (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 197, pp. 342, pl. 1*).—"It is the purpose of this publication to present in a single volume the large amount of data relating to the flow and power of Georgia streams resulting from the work of the water resources branch of the United States Geological Survey, which was begun in the year 1895. These data consist essentially of gage heights and discharge measurements that can be used to show the continuous daily flow of the streams, and of certain river profiles, in the form of tabulated elevations of water surface at points along the river, that can be used to estimate the available fall at any place. The amount of water flowing in the stream and the fall which can be used will determine the amount of power which can be developed. A quick formula to use is as follows: $\frac{\text{Flow in sec. ft.} \times \text{fall in feet}}{11} =$ net horsepower on water wheel, realizing 80 per cent of the theoretical power."

Water resources of the Kennebec River basin, Maine; quality of Kennebec River water, H. K. Barrows and G. C. Whipple (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 198, pp. VI+235, pls. 7, figs. 17*).—"A large amount of information of value in the study of this drainage basin has been gathered at various times, but much of it is scattered through various manuscripts and reports and is not readily accessible. This paper has been prepared in response to the constant demand for this information from both engineers and the public. Especial attention has been given to the subject of water storage, as this is of the utmost importance to present and future users of the water and the natural opportunities for regulating and improving flow in this basin are exceptionally good." The investigations reported were made in 1904 to 1906 in cooperation with the Maine State Survey Commission.

Surface water supply of New England, 1906, H. K. Barrows et al. (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 201, pp. 120, pls. 5, figs. 2*).—The observations reported in this bulletin are similar to those previously published as reports on the progress of stream measurements. The methods employed in making the measurements are briefly explained and records of stream flow in the principal drainage areas of New England are given.

Occurrence and use of artesian and other underground water, E. H. Sellards (*Florida Sta. Bul. 89, pp. 85–113, map 1*).—This is a preliminary report on the water resources of Florida based upon investigations made in connection with the U. S. Geological Survey and also independently by the Florida Station. A general account of the water supply is given and its usefulness for agricultural and other purposes is indicated.

The results show that Florida is abundantly supplied with water and that underground water of good quality is available for irrigating purposes in all parts of the State. Surface water occurs at varying depths in limited quantity, but artesian water occurs in abundant supply at greater depths. Flowing artesian wells occur along the coast and at very low inland elevations. The surface water is in imminent danger of contamination and ground water in limestone is also in more or less danger of contamination from natural sinks and from sewage wells. The underground waters carry considerable amounts of mineral matter in solution, but not enough to impair their usefulness for agricultural purposes.

Underground water in Sanpete and central Sevier valleys, Utah, G. B. Richardson (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 199, pp. 63+VI, pls. 6, figs. 5*).—This paper reports and discusses the results of observations on the source, distribution, recovery, and quality of the underground waters of these valleys. The data secured indicate that there is a considerable supply of underground water awaiting development in the valleys.

The composition of the waters varies with the geology of the watershed. The waters of wells of the uplands are similar in composition to that of the mountain streams of the same locality, but that from shallow wells in the lowlands, especially in irrigated districts, usually contains a large amount of dissolved salts. "The natural conditions are generally favorable for obtaining good water for domestic purposes, but the communities give little heed to the sanitary character of the water, and as a result epidemics of typhoid fever of greater or less violence are not uncommon."

The detection of pollution in underground waters, and methods of tracing the source thereof, J. C. THRESH (*Engin. News, 58 (1907), No. 5, pp. 109, 110*).—This is an abstract of a paper read before the British Association of Waterworks Engineers, which describes the use of sodium chlorid, ammonium chlorid, and fluorescin in tracing the source of pollution in wells.

The purification of sewage by peat filters, H. POTTEVIN (*Compt. Rend. Acad. Sci. [Paris] 144 (1907), No. 14, pp. 768–770*).—Experiments similar to those of Müntz and Lainé (E. S. R., 18, p. 1023) are reported.

In these experiments two earthenware cylinders 0.85 meter deep were used as the septic tanks from which the sewage was siphoned off every 24 hours upon a filter bed consisting of alternate layers of peat and chalk. Notwithstanding the fact that the experiments were made during the winter at temperatures which were not the most favorable for purification, the organic and ammoniacal nitrogen was completely oxidized in the case of sewage containing as much as 200 mg. of nitrogen per liter. The whole of the ammoniacal and organic nitrogen was not recovered in form of nitric nitrogen, but apparently a certain variable amount was lost in form of free nitrogen.

SOILS—FERTILIZERS.

The genesis of soils and the principles of a genetic soil classification, P. KOSSOVICH (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 7 (1906), No. 4, pp. 478–501*).—According to the author, the peculiarities and the character of those physico-chemical processes by which the soils were formed must be taken as a foundation for a genetic classification of soils. The soil solution is the medium in which these processes take place and, on the one hand, is determined by these processes and, on the other, influences their character by its composition; hence it follows that the nature of the soil solution must in the main determine the peculiarities and properties of the soils. The primary difference in the soil solutions which consist mainly of electrolytes is shown in the reaction of the solution which may be alkaline, neutral, or acid.

Since a neutral reaction can not long be maintained in a soil solution there exist only 2 main types of soil solution—alkaline and acid—and consequently also only 2 groups of soils. The alkaline soil formation which takes place under the influence of alkali salts of weak acids (carbon dioxid and silica) is characterized by the accumulation of bases, mainly sesquioxids, and the leaching out of silicic acid. The acid type of weathering proceeds mainly under the influence of humic acids and is accompanied by an accumulation of silica and the washing out of the bases. In the group of soils formed through alkaline weathering belong those of the deserts and steppes (chernozem), in which strong bases such as soda, potash, lime, and magnesia are present in quantities sufficient to produce an alkaline reaction in the soil solution. The group of soils of the acid type of weathering consists of the gray forest soils and the podzols which do not contain a sufficient amount of lime and magnesia to neutralize the humic acids. The eluvial soils may be distributed between these 2 types or may represent intermediate or transition forms.—P. FIREMAN.

Soil solutions: Their rôle in soil formation, methods of their examination, and their significance for the characterization of soil types, S. A. ZAKHAROV (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 7 (1906), No. 4, pp. 388–477, figs. 7*).—On the basis of a comprehensive survey of the literature and extended experiments with soils of various types, the author arrives at the following general conclusions: The soil extracts and, consequently, the soil solutions of the various soil types differ from one another in color, reaction, total content of soluble substances, and the ratio of the mineral and organic portions. Furthermore, the distribution of the soluble constituents is unlike in the different horizons as we go down in the soil.—P. FIREMAN.

Variability of the concentration of the soil solution and of the content of the soil of easily soluble compounds in dependence on external conditions, K. K. GEDROITZ (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *7* (*1906*), *No. 5, pp. 521–561*).—On the basis of theoretical considerations the author arrives at the conclusion that the total concentration of the soil solution and the concentration of individual compounds therein have no constant values, but undergo rapid changes. This conclusion he corroborates by a survey of the literature and by his own experiments. He finds the fluctuations even during short periods of time so great that it is impossible to consider the results obtained by the estimation in a soil sample of the water-soluble compounds and of the phosphoric acid soluble in acetic and citric acids at a given moment as indicative of the character of the soil.—P. FIREMAN.

Investigations on weathering processes, K. D. GLINKA (*Pochvovyedyenie* [*Pédologie*], *6* (*1904*), *pp. 293–322; 7* (*1905*), *pp. 35–62; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *7* (*1906*), *No. 6, p. 677*).—By a careful study of the weathering processes the author aims to clear up in detail the course of decomposition mainly of the aluminum silicates under various natural conditions, and to determine the character of the decomposition of these silicates when transformed into chernozem, laterite, red earth, podzol, brown laminated-columnar clay, etc.—P. FIREMAN.

Humus-carbonate soils, and their transition into podzols (Bleisand), A. F. LEBEDEV (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *7* (*1906*), *No. 5, pp. 571–592*).—The author distinguishes, first, a type of soils rich in humus, calcium carbonate, and other calcium salts (humic salts), in the upper horizon, but poor in sesquioxids and magnesia. The accumulation of silica in the upper horizon is also characteristic. Second, a type of transition of the humus-carbonate soils to the podzols, which is characterized by a complete leaching out of calcium carbonate, small humus content, an impoverishment in sesquioxids, alkaline earths, and alkalis, and an enrichment in silica. Considerable quantities of sesquioxids, alkaline earths, and alkalis are, however, found in the second horizon which forms the transition to the parent rock.—P. FIREMAN.

The geological-agronomic charting of the North German flat lands, F. WAHNSCHAFFE (*Deut. Landw. Presse, 34* (*1907*), *No. 48, pp. 399, 400*).—The agricultural features of the surveys which have been made by the Royal Prussian Geological Institute since 1873 are described. The charts prepared from these surveys show properties of the soil and the nature of the subsoil so far as it bears upon the question of the cultivation of the soil.

Soils from the Mattagami region of Canada, A. HENDERSON (*Rpt.* [*Ontario*] *Bur. Mines, 15* (*1906*), *pt. 1, pp. 151–155, fig. 2*).—Chemical analyses of 10 samples, and physical analyses of 24 samples of soil from this region are briefly reported. Somewhat less than half of its soils were clays and heavy clays. The percentage of phosphoric acid was very uniform, while that of potash varied with the amount of alumina present, and the nitrogen content was very variable. The results in general indicate that all of the soils would be comparatively easy of cultivation and show that they contain a sufficient quantity of fertilizing constituents to render them quite fertile.

The story of the soil, H. S. WILLIAMS (*Appleton's, 9* (*1907*), *No. 6, pp. 724–733*).—A popular article.

The maintenance of fertility, C. E. THORNE (*Ohio Sta. Bul. 182, pp. 131–194, pls. 5, figs. 7*).—This bulletin brings up to date the account of the investigations on maintenance of soil fertility which were last fully reported on in Bulletin 110 of the station (E. S. R., 12, p. 127).

"As at present organized, this work is being conducted at the experiment station, in Wayne County, where both field and laboratory investigations are in progress, and at the station's three test farms, viz, at Strongsville, Cuyahoga County; at Germantown, Montgomery County, and at Carpenter, Meigs County. The work on the farm of the State University was discontinued in 1900; that at East Liverpool in 1901, and that at Neapolis, Fulton County, in 1902."

The general plan of the experiments has been given in the abstracts of the previous reports referred to.

Summarizing briefly the more important results which have been obtained up to the present time, covering the 13 years, 1894 to 1906, inclusive, it was observed that in 22 of the 24 separate comparisons the complete fertilizer produced the largest total increase. In 16 of the 24 tests the combination of phosphorus and nitrogen stood second in amount of increase produced. Of the 8 exceptions in this case 5 were with crops occupying first place in the rotation crops—corn, tobacco, and potatoes—grown on sod land. "In 14 cases the combination of phosphorus and potassium occupies the third rank. In 2 cases it stands first, 4 cases second, and fourth in 3 cases and fifth in 1 crop. The fourth and fifth places are nearly evenly divided between the plat receiving phosphorus alone and that receiving potassium and nitrogen, so far as relative rank is concerned. . . .

"It is therefore evident that in all these tests, made upon soils widely different in origin, location, and previous history, and under varying systems of cropping, from a 5-year rotation on an exhausted soil with but one clover crop in each period and that usually a very poor one, to a 3-year rotation on rich land on which good crops of clover were grown every third season, it has been the complete fertilizer, carrying nitrogen as well as phosphorus and potassium, which has produced the largest increase of crop. The clover crop alone, therefore, even under the most favorable natural conditions, and when abundantly supplied with phosphorus and potassium, has not supplied sufficient nitrogen to maintain the maximum production of which the succeeding crops are capable.

"It does not follow, however, that clover growing should be dispensed with, or that the purchase of fertilizer nitrogen is recommended. On the contrary, these experiments have shown that the increased gain resulting from the addition of nitrogen to the fertilizer is frequently insufficient to justify the purchase of nitrogenous fertilizers at the present market rates, hence a cheaper source of nitrogen must be found than nitrate of soda or the still more expensive 'ammonia' of the fertilizer sack, before we can profitably reach the maximum production of our crops.

"Fortunately, such a source lies within the reach of every farmer in the form of barnyard manure."

As a general outcome of this series of experiments the author considers the following points of fundamental importance in determining the fertilizer requirements of a given crop:

"(1) The geological history of the soil upon which the crop is to be grown.

"(2) The system of cropping which is being followed and the place in that system of that particular crop.

"(3) The botanical relations of the crop itself, that is, whether it is classed with leguminous or nonleguminous plants."

A soil fertility test, G. A. CROSTHWAIT (*Idaho Sta. Bul. 59, pp. 16, figs. 5*).—This bulletin reports the results of greenhouse tests during 1906 in 4-gal. earthenware jars of typical virgin and cultivated Palouse soils.

In the fertilized series of these soils nitrogen was supplied in the form of dried blood, 15 gm. per jar; phosphorus as steamed bone meal, 6 gm. per jar;

and potash as muriate of potash, 3 gm. per jar. Kubanka durum wheat was the crop used in the experiments.

The results show that wherever nitrogen was added, whether on virgin or cultivated soil, there was a decided increase in yield, the increase being more marked, however, on the cultivated soil. Phosphorus produced a very satisfactory increase on both virgin and cultivated soils, and as with nitrogen, the increase was greater on the cultivated than on the virgin soil. Potash increased the yield to some extent, though not so much as phosphorus. Nitrogen and phosphorus combined produced a greater increase than would be expected from their effect when applied alone. It is suggested that this was due "to chemical reaction between the two fertilizers by which they were made more readily available." No considerable benefit resulted from combination of phosphorus and potash. "The use of manure gave a better result than did the use of either phosphorus or potassium, but the result was considerably less than when nitrogen was added. . . . However, the manure used was not so rich in fertility as that usually used in such experiments, much of the nitrogen having no doubt escaped."

The results in general show that the greatest need of these soils is nitrogen, and that this need increases under cultivation. It is suggested that the most economical method of supplying this need is by the culture of leguminous crops. The purchase of commercial fertilizers except in a small way to be used in testing the soil is not at present recommended.

A study of Rhode Island soil requirements by means of field tests, G. E. ADAMS (*Rhode Island Sta. Bul. 121, pp. 139–175*).—An account is given in this bulletin of 15 cooperative experiments conducted during the season of 1906 on 4 different soil types of Rhode Island, namely, Gloucester stony loam, Miami stony loam, Warwick sandy loam, and Alton stony loam, to determine the fertilizer requirements of the soils and to compare the results obtained in field experiments with those obtained on the same soils by the wire-basket method of the Bureau of Soils of this Department (see below). The crops grown were purple-top turnip in 14 trials, Swedish turnip in 7 trials, and spring wheat in 12 trials.

"From the results obtained from this series of experiments, conducted for one season, there appears to be no relation between the soil type and the plant food requirements of a given soil. . . .

"Hydrated lime often exerts an injurious effect upon certain crops, when grown upon the lighter soils, if applied immediately before the seed is sown, even though the soil reddens blue litmus paper. This caustic action upon the roots of young plants is, however, only temporary, as shown by the benefit derived from liming, by crops the seed for which was sown a few weeks after applying the lime. No appreciable difference was noted in the benefit derived from an application of the same quantity of calcium oxid, whether in the form of ground limestone or in hydrated lime."

Soil tests in paraffined wire baskets compared with tests on farms, B. L. HARTWELL and C. L. COOK (*Rhode Island Sta. Bul. 120, pp. 109–138, pls. 2*).—This is a report on cooperative experiments with the Bureau of Soils of this Department in which soils from 15 different localities in Rhode Island were tested with wheat by the wire-basket method of the Bureau "to ascertain the effects of lime, of a complete fertilizer with and without lime, and of omitting potassium, phosphorus, or nitrogen from the complete fertilizer when used with lime," and to compare the results obtained by this method with those obtained in field experiments on the same soils in place. Some of the soils were also tested by similar methods in 8-in. Wagner pots, in which the wheat was grown for a much longer period than in the wire baskets.

"As a result of the first year's experiments with the baskets, benefits resulted from liming, both with and without the fertilizer, in 11 out of the 15 experiments.

"Nine of the 11 soils which were benefited by liming produced by the basket method larger crops when lime alone was used than when the complete fertilizer was added without lime; in some cases the fertilizer gave no increase at all until the soil had been limed. This does not show, of course, that it is more economical to add lime than fertilizer; for the best crops were as a rule obtained when the two were combined.

"The practice of adding ordinary commercial fertilizers only to soils primarily in need of liming is of doubtful economy.

"Soil tests which are conducted upon land to which lime has been added just before planting may give very different results from those which would be obtained after the lime had exerted its full action upon the soil.

"In the case of soils with which the effect of lime in liberating plant-food ingredients is marked, the details of its application may be of such importance as to change the relative deficiencies of potassium, phosphorus, and nitrogen as shown in the following paragraph.

"Three soils which exhibited a lack of potassium primarily, by the first trials in the baskets, showed by subsequent trials, with new portions of the same soils, that potassium was no longer the element which was principally deficient. The same amounts of lime, potassium, phosphorus, and nitrogen were added; the difference in the two trials being in the temperature at which the soil and the added materials were allowed to remain before planting.

"The gain, by the basket method, from the addition of muriate of potash was greater when the green weights, rather than the amount of transpired water, were taken as a criterion. The acid phosphate and the nitrogenous manures did not exhibit the same tendency.

"The element which was shown by the basket method to be the most deficient one in the case of a given soil was usually found prominently, if not principally, deficient by the field test. There were, however, in many instances subordinate though quite marked deficiencies in the field which were not indicated with certainty during the short period of growth of the wheat in the baskets."

Soil biology in its relation to fertilization, J. L. Hills and C. H. Jones (*Vermont Sta. Bul. 130, pp. 213-290*).—This article attempts to present in "as readable and popular a manner as possible without the sacrifice of essential accuracy of statement . . . what is conceived to be the present understanding of soil biology as it relates to fertilization and particularly to the soil nitrogen content."

The article treats of the nature and classification of micro-organisms in general, the propagation and environment of bacteria, soil bacteria affecting mineral ingredients and soil bacteria affecting organic ingredients, the nitrogen cycle, nonbacterial nitrogen losses, and the balance of nitrogen gains and losses.

It also contains a glossary of technical terms used and a partial list of publications consulted in the preparation of the article.

The feeding of plants by the free living nitrogen-fixing bacteria of the soil, A. Koch (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 12, pp. 117-121, figs. 2*).—This article summarizes briefly the results of a continuation of investigations on this subject (E. S. R., 18, p. 16), discussing the results more particularly in their practical bearings.

When sugar was added in varying amounts (20 to 80 gm. per kilogram of soil) it was found that the largest fixation of nitrogen per gram of sugar occurred in the soil to which sugar was added at the 20 gm. rate, the amount of fixation being on an average 10 mg. of nitrogen to each gram of sugar added. Practically the same rate of fixation was shown by pure cultures of Azotobacter. When the amounts of sugar were increased to 40, 60, and 80 gm. per kilogram of soil there was an absolute increase in fixation, but a steady decrease per gram of sugar. Beyond 80 gm. there was a rapid absolute decrease. Fractional weekly applications of sugar of 2 gm. each for 8 weeks gave about the same fixation as 20 gm. in one application. With 2 gm. of sugar in 18 weekly applications there was a decided decline in fixation, and the same was true in case of repeated applications of somewhat stronger sugar solutions. When, however, 18 separate applications of 20 gm. each of sugar were made there was a large absolute increase in fixation of nitrogen, amounting to 0.8 gm. per kilogram of soil.

There was a distinct loss of nitrogen when sugar was applied in March while the temperature of the soil out of doors was still low. Active fixation set up, however, when the soil was brought into a warm room.

The application of lime not only did not increase fixation of nitrogen, but in some cases actually lowered it. The injurious effect of potassium salts, especially the chlorid, was quite pronounced. On the other hand, applications of phosphoric acid very greatly promoted fixation. Carbon bisulphid did not increase fixation, and in many cases reduced it somewhat. Fixation was decidedly increased by applications of iron sulphate.

In pot experiments with applications of molasses as a cheap source of carbonaceous food for the nitrogen-fixing bacteria there was a decided loss of nitrogen, thought to be due to the fact that the molasses contained nitrogen compounds which were easily decomposed by the organisms which fed upon this nitrogen rather than upon the free nitrogen of the air. Organic matter of vegetable origin was not found in these experiments to be a good source of carbonaceous food for the nitrogen-fixing organisms.

In pot experiments with buckwheat, oats, and other crops there was a decided decrease in yield the first year when the sugar was applied in March in the open. The following year, however, there was an increased fixation of nitrogen and a marked improvement in growth and yield of crop on the soil to which sugar had been applied the previous fall, indicating that the nitrogenous matter elaborated by the nitrogen-fixing organisms is readily assimilated by higher plants, and that there was a close and direct correlation between fixation of nitrogen, nitrification, and increase of yield.

Soil inoculation by means of pure cultures, J. Vanderghem (*Bol. Min. Fomento* [*Peru*], *4* (*1906*), *No. 12, pp. 9–12*).—Inoculation experiments with alfalfa are briefly reported. Inoculation was ineffective on soil which had previously grown a leguminous crop.

On the action of the micro-organisms in rendering the potash of leucite in soils available to higher plants, S. de Grazia and G. Camiola (*Staz. Sper. Agr. Ital.*, *39* (*1906*), *No. 9, pp. 829–840; abs. in Chem. Zentbl.*, *1907*, *I*, *No. 19*, *p. 1451; Jour. Chem. Soc.* [*London*], *92* (*1907*), *No. 538, II, p. 641*).—In investigations on leucite, similar to those on insoluble phosphates already referred to (E. S. R., 18, p. 920), it was found that the amount of potash in the soil solution was greater when micro-organisms were present than when they were absent. It is suggested that the organisms absorbed and assimilated the potash and so made it more readily available for higher plants.

Experiments on the lasting effect of green manure nitrogen on light, sandy soils, C. von Seelhorst (*Mitt. Deut. Landw. Gesell.*, *22* (*1907*), *No. 14*, *pp. 139–144*).—From the results of experiments made in large casks, in 1906, the conclusion is drawn that green manures turned under in October on light, sandy soils decompose so rapidly that during the course of a mild wet winter half of the nitrogen has been removed in the drainage water by February and March. It is therefore recommended that green manures should not be turned under on such soils very far in advance of the planting of the crop.

Modern methods of promoting the rational fertilization of farm crops, E. WEIN (*Jahrb. Deut. Landw. Gesell., 22* (*1907*), *No. 1, pp. 26–41*).—A general discussion of this subject.

Fertilizers, D. W. MAY (*Porto Rico Sta. Circ. 6, English and Spanish eds., pp. 16*).—The general principles underlying the use of natural manures and commercial fertilizers with special reference to Porto Rican conditions are explained, with more specific directions regarding the use of fertilizers on cotton, tobacco, sugar cane, citrus fruits, and pineapples.

Fertilizer experiments on peat soils continued for 16 years, H. VON FEILITZEN (*Svenska Mosskulturfor. Tidskr., 21* (*1907*), *No. 2, Bilaga, pp. 199, 212*).—The experiments have been conducted at Tobo, Sweden, since 1891, on a marsh soil (*starrtorf*) with clay subsoil, the former containing 3.41 to 4.75 per cent lime, 2.23 to 2.86 per cent nitrogen, 0.06 per cent potash, and 0.07 per cent phosphoric acid (in extract). The fertilizers applied during the series were mostly Thomas slag in varying amounts, with potash and nitrate. The results show the beneficial effect of an annual fertilization with both phosphoric acid and potash on the yield and quality of the hay crop for meadows on good and well-cared-for peat land, and that the land can be kept in grass for a long series of years by this system. The trials also furnish evidence that a liberal fertilization of phosphoric acid and potash pays especially well on account of the after-effect which can be observed from the same for many years afterwards.—F. W. WOLL.

Fertilizer experiments with nitrogen in different forms and amounts, CLAUSEN (*Deut. Landw. Presse, 34* (*1907*), *No. 30, pp. 248, 249, fig. 1*).—Comparisons of nitrate of soda and sulphate of ammonia on moor, sand, and loam soils are reported.

The effect of ammoniacal and nitric nitrogen on the development of corn, M. SOAVE (*Ann. R. Accad. Agr. Torino, 48* (*1906*); *abs. in Staz. Sper. Agr. Ital., 39* (*1906*), *Nos. 10–12, pp. 1100–1105*).—Experiments in nutritive solutions and in soils are reported which confirm the general belief that ammoniacal nitrogen must be first transformed into nitric nitrogen before it can be assimilated by the maize plant.

Studies on the value of calcium cyanamid as a nitrogenous fertilizer, A. MÜNTZ and P. NOTTIN (*Ann. Inst. Nat. Agron., 2. ser., 6* (*1907*), *No. 1, pp. 145–183*).—After a brief review of the more important literature relating to the preparation and use of calcium cyanamid, the authors report the results of their own laboratory and culture experiments with this material.

The use of the Kjeldahl method for determining the nitrogen in calcium cyanamid is recommended, complete reduction being brought about in one-half hour. Comparative tests of the rate of nitrification, by the Müntz and Girard method, showed that the amount of nitrogen nitrified in 5 months was in the case of ammonium sulphate 100 per cent, calcium cyanamid 88 per cent, dried blood 66 per cent, and roasted leather 26 per cent. The low rate of nitrification was due to the fact that the application of the cyanamid in the amounts used in these experiments (10 and 20 times that used in practice) retarded nitrification and even resulted in denitrification at the beginning. When applied in normal amounts or in large amounts fractionally nitrification was apparently not interfered with and was practically as active as in the case of ammonium sulphate.

The experiments indicated that the retarding effect of calcium cyanamid on nitrification is not due (or only in minor degree) to the caustic lime present, but to the cyanamid itself. It was also observed that larger applications of the cyanamid could be used on soils rich in humus without retarding nitrification than on those poor in humus.

A sample of cyanamid kept exposed to the air from November 21 to June 15 increased in weight from 100 to 120.3 gm., and its nitrogen content decreased from 20.07 per cent to 15.96 per cent, due to escape of ammonia. There was no loss in 42 days when cyanamid was mixed with kainit. When mixed with superphosphates the temperature of the mixture rose perceptibly, and there was an immediate loss of about 5 per cent of the original nitrogen. When stirred up with water and allowed to stand for a long time there was a gradual loss of nitrogen.

Applications of 200 kg. per hectare of cyanamid had no effect on earthworms. Experiments with a large number of different kinds of crops on a great variety of soils and under different climatic conditions indicate the cyanamid to be fully as effective as ammonium sulphate as a fertilizer, and that it does not retard germination or suffer loss in top-dressing when used in normal amounts. It may be considered the equivalent of ammonium sulphate when used in equal amounts and applied in the same manner.

Experiments in fertilizing rice with calcium cyanamid, A. Menozzi and E. Grüner (*Ann. Ist. Agr.* [*Milan*], *6* (*1901–1905*), *pp. 51–77; abs. in Staz. Sper. Agr. Ital.*, *39* (*1906*), *No. 10–12, pp. 1132–1134*).—In the experiments reported calcium cyanamid gave almost as good results as ammonium sulphate.

Investigations on the action of lime niter, A. Stutzer (*Jour. Landw.*, *55* (*1907*), *No. 1–2, pp. 69–77; abs. in Jour. Chem. Soc.* [*London*], *92* (*1907*), *No. 538, II, p. 646*).—Pot experiments with neutral and basic lime niter on oats, fodder beets, and potatoes are reported, showing about the same effect from the two materials. The results with potatoes were especially favorable and superior, as regards both yield and starch content, to those obtained with sodium nitrate. On fodder beets the medium and heavier applications of lime niter (58 to 116 lbs. per acre) were as a rule fully as effective and in some cases more effective than sodium nitrate. The poor development from other causes in the case of the oats made the results inconclusive. The neutral lime niter used in these experiments contained 25.8 per cent of lime and 12.47 per cent of nitrogen. The basic material contained 43.7 per cent of lime and 10.56 per cent of nitrogen.

The future of the manufacture of nitrogenous fertilizers from the air, Maizières (*Engrais*, *22* (*1907*), *No. 22, pp. 516, 517*).—A statement is given showing the works which have been or are being established for the manufacture of calcium cyanamid in different countries of the world.

An agricultural problem (*Tradesman*, *57* (*1907*), *No. 9, p. 63*).—Reference is made in this article to the purpose of a hydro-electric power company in Tennessee to undertake the manufacture of calcium cyanamid.

Investigations on the combustion of elementary carbon and nitrogen. Berthelot (*Compt. Rend. Acad. Sci.* [*Paris*], *144* (*1907*), *No. 7, pp. 354–357; abs. in Bul. Soc. Chim. France*, *4. ser.*, *1* (*1907*), *No. 11, p. 608*).—A study of the decomposition of cyanogen by means of the electric spark is reported, from which the conclusion is drawn that there is no stable equilibrium between pure nitrogen and carbon.

The electro-chemical problem of nitrogen fixation, P. A. GUYE (*Monit. Sci., 4. ser., 21 (1907), I, pp. 225–236; abs. in Chem. Zentbl., 1907, I, No. 23, p. 1647*).—The general problem is stated and the Frank-Caro and electro-chemical processes are discussed.

The author believes that the problem of electro-chemical preparation of nitric acid will only be completely solved when methods of liquefaction of the air and the separation of its constituents have been perfected. The solution of the problem also depends upon the production of cheap electrical power from coal. The author estimates the present cost per pound of production of nitric nitrogen to be 11.4 cts. in form of lime niter, and 10.5 cts. in form of nitric acid assuming the cost of power to be $10 per kilowatt year. His estimate of the cost per pound of nitrogen in the form of cyanamid varies from 12 to 14 cts.

The fixation of the nitrogen of the air and lime niter, A. RIGAUT (*Rev. Sci. [Paris], 5. ser., 7 (1907), No. 25, pp. 778–780*).—The cost of the production of nitrates from the nitrogen of the air by electrical processes and the agricultural value of the product so obtained are briefly discussed mainly on the basis of a recent article by Guye noted above.

The use of feldspathic rocks as fertilizers, A. S. CUSHMAN (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 104, pp. 32*).—The importance of potash as a constituent of fertilizers, the occurrence of potash in nature, the availability of the potash of ground rock, the effect of fineness of grinding, cost of ground feldspar, and extraction of potash from ground feldspar (E. S. R., 18, p. 717) are discussed and the literature of the subject reviewed. A limited number of greenhouse and field experiments in which fine ground feldspar was used on tobacco are briefly reported.

The general conclusion reached is that "systematic and long-continued experimentation is the only possible method of obtaining conclusive information on the subject. The evidence so far obtained appears to indicate that under certain conditions and with certain crops feldspar can be made useful if it is ground sufficiently fine. On the other hand, it is highly probable that under other conditions the addition of ground feldspar to the land would be a useless waste of money. At the present stage of the investigation it would be extremely unwise for anyone to attempt to use ground rock, except on an experimental scale that would not entail great financial loss. . . .

"It is extremely unlikely that ground rock will ever entirely displace the use of potash salts, for its availability must inevitably depend upon many modifying conditions, such as the nature of the soil, the amount of moisture present, the character of the other fertilizers used, and the varying root action of different crops. With tobacco the results so far obtained have been encouraging, but it is possible that this plant, which is a voracious feeder, can make use of the potash in fine-ground feldspar to a greater extent than other fast-growing crops, such as potatoes and the cereals, some of which mature in practically 60 days and must therefore find their plant food in a highly available condition."

Influence of calcium carbonate on the development of yellow lupine in podzol (Bleisand) soil, A. F. KHANDURIN (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 7 (1906), No. 6, pp. 667–676, figs. 10*).—The author found that calcium carbonate is useful for the development of lupines in the early stages of their growth but injurious at later stages. The carbonate interferes with the full development of the root tubercles, whose function in supplying nitrogen is of greater importance in the later stages of the growth of the lupines.—P. FIREMAN.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Bul. 122, pp. 177–187*).—"This bulletin contains the analyses of such potato and vegetable fertilizers found on sale in the State in the spring of 1907 as had been licensed at the time the manuscript was sent to press. A second bulletin, to be published later in the season, will contain a report on the other fertilizers which have been and may yet be collected and examined."

Commercial fertilizers, J. L. HILLS and C. H. JONES (*Vermont Sta. Bul. 130, pp. 155–212*).—This is a report on inspection of fertilizers offered for sale in Vermont during the spring of 1907. Of 129 brands examined, 77 per cent met their guaranties, and the quality of the crude stock used in manufacturing the fertilizers seemed on the whole to be satisfactory. The average selling price of the fertilizers was $30.57, the average valuation $21.21. As in previous reports a comparison is made of analyses of certain brands during 5 years.

Ready reckoner fertilizer chart, O. THACKER (*Columbus, Ohio, 1906, pp. 44*).—This book gives tables for finding the price of fertilizers at different ton prices ($10–$29), when put up in bags of different sizes.

AGRICULTURAL BOTANY.

Studies in plant regeneration, ELSIE KUPFER (*Mem. Torrey Bot. Club, 12 (1907), No. 3, pp. 195–241, figs. 13*).—Experiments were made with budless portions of roots, stems, leaves, inflorescences, and fruits to determine their powers of regeneration, the subjects of the experiments being for the most part flowering plants.

The results obtained demonstrated that every part of the plant, even when preformed rudiments were absent, had some power of regeneration, although in a majority of cases it was not complete enough to establish a new plant.

Among the author's conclusions it is stated that the disposition to form roots is much more generalized throughout the plant and more easily energized than the power to form shoots.

Experiments showed that regeneration is dependent upon an adequate food supply. In plants from which the reserve food had been exhausted by a prolonged exclusion from the light, no regeneration took place if the parts were subsequently darkened, or if carbon dioxid was absorbed from the atmosphere in which they were kept.

Certain parts of plants failed to regenerate one or the other kind of organs when each of the conditions assigned as causes of regeneration had been fulfilled, and it seems necessary to assume the existence of specific substances which are responsible for the formation of those organs. The author believes that different enzyms which are localized in definite parts of a plant are responsible for this regeneration, and a series of experiments has been inaugurated to test this assumption.

Physiologically balanced solutions for the growth of plants, O. LOEW and K. ASO (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 395–409, pl. 1*).—Experiments were carried on with different solutions to determine the effect of the one-sided nutrition of plants.

It was found that physiologically balanced solutions are fundamentally important to the best development of higher plants. For lower forms of algæ and fungi balanced solutions were not necessary. Potassium sulphate and nitrate proved injurious to plants when their concentration was abnormally high. Potassium salts were found to retard, but not prevent the toxic effects of magnesium salts, and the cause of the retardation to be entirely different from the prevention of this toxic action by calcium salts.

Observations on the stimulation of plant growth, S. KAKEHI and K. BABA (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 455, 456*).—The authors conducted a series of experiments with peas and barley to test the effect of manganese carbonate as a stimulant to plant growth. The chemical was found to exert a moderate stimulation on peas and less upon barley.

In a second series of experiments with wheat comparisons were made between manganese sulphate and sodium fluorid, and it was found that in addition to the stimulating effect of both chemicals, manganese sulphate produced much better results than sodium fluorid.

The physiological rôle of phosphoric acid in the nutrition of plants, Gabrielle Balica-Iwanowska (*Bul. Acad. Sci. Cracovie, 1906, pp. 616–642; abs. in Jour. Chem. Soc.* [*London*], *92* (*1907*), *No. 535, II, p. 386*).—In plants germinating in a liquid free from phosphoric acid an increase of mineral phosphorus was found to take place at the expense of organic phosphorus compounds. The phosphorus thus separated from the organic compounds is not utilized for the reproduction of organic phosphorus compounds when no further amount of phosphates is supplied. When plants are deprived of phosphoric acid a portion of the organic phosphorus compounds formed previously in the plant is decomposed, as in the case of the germinating seeds.

Under normal conditions barley plants transform relatively small amounts of phosphates into organic compounds up to the time of flowering, the change being chiefly made during the production of seed. At this period the nucleo-proteins migrate toward the grain, and during ripening a portion of the phytin separates from the protein compounds.

The effect of acids and alkalis on chlorophyll, R. Willstätter and F. Hocheder (*Liebig's Ann. Chem., 354* (*1907*), *No. 2, pp. 205–258, fig. 1*).—While there have been many studies made on the effect of the alkalis and acids on chlorophyll, the authors claim that none show the changes in structure and composition of the chlorophyll molecule. According to them, chlorophyll is a very complex magnesium compound.

The first effect of acids upon chlorophyll is said to be the elimination of the magnesium. The molecule of chlorophyll after reacting with the acid is an ester without basic or acid properties. The effect of alkalis on chlorophyll is the saponification of the esters, an alcohol, $C_{20}H_{40}O$, being formed while the magnesium in the molecule remains. The alcohol formed is called "phytol" and is said to be present in the chlorophyll of all plants.

The ascent of water in trees, A. J. Ewart (*Proc. Roy. Soc.* [*London*], *Ser. B, 79* (*1907*), *No. B 533, pp. 395, 396*).—An abstract is given of a paper presented by the author in which he offers evidence to show that the ascent of water in trees is a vital problem depending upon conditions which can only be maintained in living wood. He concludes that the living cells in tall trees continually restore the conditions for the ascent of water wherever these are affected by the excessive emptying of the vessels, and decrease resistance to flow, as far as possible, by maintaining continuous water columns in portions of the wood. So long as these conditions are present a pumping action only becomes necessary in trees over 20 to 50 meters in height, but suspended columns can not be maintained for any length of time in the vessels of tall trees without the aid of the living cells of the wood.

The nature of enzyms, H. E. and E. F. Armstrong (*Proc. Roy. Soc.* [*London*], *Ser. B, 79* (*1907*), *No. B 533, pp. 360–365*).—The authors summarize some of the more important views relating to enzyms and call attention to some of the principal issues which remain to be determined. According to their view, the action which an enzym exercises is specific; that is, it is limited to compounds of a particular type to a greater extent than has hitherto been recognized.

The enzyms of yeast, amygdalase, R. J. Caldwell and S. L. Courtauld (*Proc. Roy. Soc.* [*London*], *Ser. B, 79* (*1907*), *No. B 533, pp. 350–359*).—In a study of the enzyms of yeast the authors have separated a new enzym to which the name amygdalase is given. They state that the hydrolysis of amygdalin is due to a hitherto unrecognized constant of yeast which is the active agent in separating the glucose. This enzym was separated by a system of extraction at different temperatures, and its characteristics are described at length. It appears to be equally well extracted from dried yeast at temperatures from 15 to 45° C., and while a small quantity can be obtained at zero temperature, the amount may be greatly increased by heating for a short time to 45°.

The action of naphthalin on plants, K. Aso (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 413–417, pl. 1*).—On account of the recommendation that naphthalin might be used to prevent attacks of nematodes, bacteria, etc., the author carried on some experiments to test the influence of naphthalin in cultures containing barley, peas, buckwheat, millet, and rice.

It was found that naphthalin could prevent the development of various soil bacteria, although it did not kill them. In the proportion of 0.005 to 0.01 per cent added to the soil naphthalin caused a moderate stimulation with barley, buckwheat, and millet, but not with peas and rice. An increase to 0.05 per cent injured the growth of all the plants. The injurious action is attributed to the vapors of the naphthalin spreading through the soil, and since it injures plants it can not be recommended as a remedy against nematodes, at least not in greater quantities than 0.005 per cent of the soil.

The accumulation of arsenic in the fruit of certain plants, B. Gosio (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 15 (1906), I, pp. 730–731; abs. in Centbl. Bakt.* [etc.], *2. Abt., 18 (1907), No. 22-23, pp. 724, 725*).—The author grew in boxes two squash plants, which, after they had attained a length of 1 meter, were regularly watered with arsenic water of a strength of 1 part metallic arsenic to 1,000,000 of water After one month the strength of the arsenic water was increased to 1 part in 100,000 and a month later to 1 part in 10,000. This was used to water the plants until their growth was completed.

Leaves, stems, flowers, and fruits were analyzed for arsenic, and it was found most abundant in the fruits, where it was present as metallic arsenic to the extent of 0.0041 per cent. By gradually accustoming the roots to the effect of arsenic the author believes even greater amounts would probably be stored up.

Causes of injury to vegetation near a large industrial establishment, P. Frazer (*Bi-Mo. Bul. Amer. Inst. Min. Engin., 1907, No. 15, pp. 377–434, figs. 2*).—By means of experiments with saturated cloths, analyses of plants, and the quantitative determination of sulphur in the air, the author has proved that the injury to vegetation was due to the gases given off by a large establishment. Studies were also made of the soot and dust driven out from smokestacks and their effect on plant growth. A bibliography, with synopses of conclusions, of a number of important contributions to the literature of this subject is given.

FIELD CROPS.

The importance of nitrogen in the growth of plants, T. F. Hunt (*New York Cornell Sta. Bul. 247, pp. 179–203, figs. 3*).—The thesis of this bulletin is that the amount of water soluble nitrogen occurring in the soil at a critical time in the plant's life history may be a limiting factor in the growth of the crop. With reference to this point the importance of nitrogen in the growth of plants, the difference between nitrogen and other elements, the function of nitrogen, the relation of total and water-soluble nitrogen, the purpose of cultural methods, the conservation of moisture, and the results of diffeernt experiments considered as bearing on this subject are discussed. The discussion on the influence of early and late spring plowing on corn production and the factors influencing the supply of water in the soil are based on the work of M. Quiroga (E. S. R., 16, p. 356).

In considering the influence of weeds the experiments of Cates are quoted, which show that plats on which maize was grown with rye, millet, and weeds contained less moisture than maize plats kept cultivated, and that the yield of ear maize was much greater where weeds were not allowed to start until June 27 instead of on June 14, although the difference in the percentage of moisture in both series of plats was nearly the same. Determination of water-soluble nitrogen in parts per million of dry soil here quoted indicate a great decrease in the water-soluble nitrogen where the weeds grew and the land was not stirred, as compared with plats which were stirred and no weeds allowed to grow. The results of another test described in this connection show that plats scraped to prevent the growth of weeds but not stirred yielded nearly as well as those that were stirred thoroughly in removing the weeds, while the yield of grain was greatly reduced on plats on which weeds were allowed to grow after the first cultivation. The author considers the results as suggesting that the failure of the maize to properly develop was due to other causes than lack of water or available nitrogen. The influence of weeds as determined by Hosford is also outlined.

Plats varying from quite a sandy loam to a clay loam, with the soil moisture ranging from 10.6 to 17.8 per cent, varied in yield of green maize fodder from 731 to 1,001 lbs. Other experiments quoted show that the growth of millet or weeds greatly checked the growth of maize, the yield of green substance where millet was sown being only one-tenth and where weeds were allowed to grow only one-fifth of that grown under ordinary cultivation, and that the total green product produced on the weedy plats was much less than on those cultivated in the usual way. It is also pointed out that the percentage of moisture was only slightly less on weedy than on cultivated plats. The question is asked as to whether the growth of maize was checked by the diversion of some of the water to the weeds and two reasons are given for believing that while the available water may have been a factor in this respect there must have been some other influence also. Thus the total product was not so great on the weedy plats as on the cultivated plats, and it is entirely probable that although in a dry season all the plats would have had a lower percentage of water the cultivated plats would have produced more maize than the weedy plats produced this year.

A table is given showing the water-soluble nitrogen in parts per million of dry soil on a cultivated plat and on a millet plat at different dates, and also on a plat to which nitrate of soda was applied. It is pointed out that on July 2 the cultivated maize plat contained 96 parts of water-soluble nitrogen per million of dry soil, while the maize and millet plat contained only 10 parts. The maize where millet grew was of a lighter green color and smaller size than where it was grown by itself, and it was reasoned that the addition of nitrate of soda should cause the maize to recover its green color and grow more rapidly than maize and millet not so treated. For this purpose twice the amount of nitrate of soda necessary to supply 86 parts per million of dry soil was applied to 35 hills of a maize plat on July 6, 14, 21, and 27. On July 14 both the maize and millet were much greener than the rest of the plat not so treated, and on July 18 the hills were distinctly larger than the untreated hills of the millet plat and as green as the plants on the cultivated plat. It was found that between July 30 and August 16 the water-soluble nitrogen increased from 160 to 320 parts of NO_3, while all the nitrate of soda was applied some time previous to the first date. The application of the nitrate doubled the growth of the crop, while the percentage of water in the soil remained the same. It is pointed out as most likely that the decrease in growth in the first instance was due in part to a lack of water-soluble nitrogen, and that the subsequent increased growth was due directly to the nitrogen applied and that it served as plant food. The results are taken as suggesting that weeds by taking up a portion of a small amount of nitrogen just at the critical period of the plant which is being cultivated may cause the injury so commonly observed.

A series of observations on alfalfa made at the Cornell Station (E. S. R., 17, p. 1059) and bearing on the subject under discussion are reviewed. "When nitrate of soda is added to the soil, as repeatedly shown in the investigations at this [Cornell] station and elsewhere, part of the nitrogen is fixed in the soil and a part of it goes into solution. What probably happens is that as the soil is exhausted of its water-soluble nitrogen by the paint, a part of this fixed nitrogen goes into solution. The behavior of nitrate of soda when applied to soils strongly indicates this action. What probably happens is, that when nitrate of soda is applied more nitrogen keeps going into solution, at just the time when the plant is making great demands on the soil for this nitrogen, than when nitrate of soda is not added."

On the assimilation of the elements of nutrition by plants during different periods of their growth, H. WILFARTH ET AL., trans. by B. L. EMSLIE (*London [1907], pp. 72, pls. 2*).—This is a translation from the German of an article already noted (E. S. R., 17, p. 856).

Report of the royal Bohemian agricultural academy at Tábor, 1906, T. ERBEN ET AL. (*Ztschr. Landw. Versuchsw. Osterr., 10 (1907), No. 4, pp. 411–430*).—A brief review of the year's work at the school is given. Variety tests are reported of 30 varieties of winter wheat, 10 of spring wheat, 10 of rye, 38 of barley, 29 of oats, 200 of potatoes, and 3 of fodder beets.

The best yields of grain from among the winter wheat varieties were secured from Cimbal, Kirsche, and Strube. The results with barley again showed the superiority of the well-selected common strains, as compared with sorts derived from Chevalier and Imperial barleys. The highest grain yields were obtained from Nolč Bohemia and Hanna from Proskowetz. Svalöf Hannchen, Primus, and Nolč Early ranked first in starch content. The lowest protein content was shown by Hannchen and Nolč J. 16 and J. 19. The best yield of oats were secured from Svalöf Goldregen, Hwittling, and a number of newly bred varieties such as Leutewitz Yellow, Strube Schlansted, and Kirsche Prolific. Of the different potato varieties under test, Director Nydrie, Prof. Nilsson, and Brocken led in starch production, with 4,950, 4,558, and 4,747 kg. of starch per hectare.

The average yields of 3 varieties of fodder beets were as follows: Eckendorf Red 369.3 kg., Eckendorf Yellow 354.8 kg., and Red Mammoth 338.1 kg. per are.

Tests of nitrate of soda and liquid manure as fertilizers for sugar beets were made, the results indicating that the use of liquid manure, while not producing as large yields as nitrate of soda, is more economical. The method of fertilization had apparently no influence on the quality.

In cooperative tests with 5 varieties of winter wheat, an average yield of 2,482 kg. per hectare was secured. The squarehead varieties survived the winter well and ranked first in yield, while Landas Gigantea stood last.

The yields in cooperative tests with oats were as follows: Duppau 3,167, Strube Schlandsted 3,119, Svalöf Ligowo 3,013, and Heraletz Late 2,930 kg per hectare.

The leading potato varieties were classified according to their quality as follows: Nilsson, Maincrop, and Sophie as excellent; White King, Gryf, and

Yellow Pearl as good; and Irene and Brocken as medium. Nilsson and Sophie are considered excellent table varieties, White King a good general variety, and Brocken and Gryf good sorts for starch manufacture. In a second potato experiment it was observed that Up-to-Date and White King are badly attacked by rot, while Walküre, Stella, Svatováclavské, and President Ascher are quite resistant to rot. Nilsson, Iduna, Walküre, and President Ascher were found to be prolific table varieties, and Up-to-Date and White King good yielding general sorts.

Baking tests with the flour of different varieties of wheat were conducted, and it was determined that the best variety in the collection was a cross by Rimpau of a very early American variety with Squarehead.

Arid farming investigations, W. M. JARDINE (*Utah Sta. Bul. 100, pp. 129–156*).—The work reported in this bulletin is with but few changes a continuation of previous experiments (E. S. R., 16, p. 862). The results secured with different crops at the various farms are tabulated. In many instances wide variation existed from year to year with the same varieties grown upon the same farms, as well as in the yields on different farms.

In the winter wheat experiments the two complete failures recorded are from 2 spring varieties of durum wheat, Black Don 8232 and Pellessier 7785. These two varieties, however, show great promise of developing into excellent fall varieties. Turkey wheat led all other varieties tested for any one year on the different farms, with a yield of 33.9 bu. per acre, and also gave the highest average yield on 3 out of the 5 farms on which it was grown. Lofthouse, Gold Coin, and Koffoid are popular and excellent drought resistant varieties.

It was observed that the number of kernels per ounce of wheat varies materially with the rainfall. On the Iron County farm, where the precipitation was very light, wheat showed from 10 to 20 kernels per ounce more than the same varieties grown on the Juab County farm, where the average rainfall was from 2 to 3 in. greater, and it is pointed out that seeding at the rate of 2 pk. per acre of the wheat produced on the Iron County farm would probably mean as many kernels per acre as seeding at the rate of 3 pk. per acre of the wheat produced on the Juab County farm. The results of sowing fall wheat at different times indicate that on the Iron and Washington county farms the sowing should be done from September 15 to October 1, on the Juab County farm from October 1 to 15, and on the San Juan farm from September 1 to 15.

Spring varieties of wheat yielded from 5 to 20 bu. per acre less than the fall varieties grown under the same conditions. The leading variety according to yield was Romanow, producing 26.66 bu. per acre in 1905 on the San Juan farm. Mohammed ben Bashir 7792, a durum wheat, gave the best average yields for the 3 years grown, 12.4 bu. per acre on the Juab farm. Other promising spring varieties for dry farms are Kahla 7794, Medeah 7594, both durum wheats, and William Fife, a soft wheat.

Oats were sown about April 15 with a press drill at the rate of 4 pk. per acre, and the field harrowed thoroughly two ways when the crop was about 3 in. high. The plants grew from 18 to 36 in. high. Black American gave the best average yield for the 3 years, averaging 31.7 bu. per acre. The best yield in any one year, 36.81 bu. per acre, was secured from Sixty Day, which, however, gave an average yield of only 22.62 bu.

Among the varieties of barley, California led in average yield with 24.3 bu. for the 3 years, and also produced the highest yield, 34.9 bu., in any one year. California Prolific and Success also gave very good yields, and the results as a whole are taken as indicating that barley can be considered one of the promising dry farm crops, especially where the annual precipitation exceeds 14 in.

Corn yielded 25.93 bu. on the Iron County farm in 1904, being the highest yield of any crop grown on that farm during the 3 years. In 1906 over 4½ tons of fodder were secured on this same farm, but the frost came before the corn matured. On the Washington County farm the highest yield produced in the 3 years was 24.7 bu. of ears and 1,936 lbs. of stover in 1906.

The following yields of alfalfa were secured on the Juab farm in 1905: Turkestan 1,500 lbs. of hay, Sand 2,050 lbs., seed from irrigated native crop 2,330 lbs., and seed from native dry land crop 2,300 lbs. On the Iron County farm, where the rainfall was low, plats containing one plant per square foot gave the best yields, 620 lbs. air-dried hay per acre in 1906. The use of 8 lbs. of seed per acre gave the best average results. Very little difference was noticeable between early and late spring seeding. The use of the press drill upon a well-prepared seed bed is recommended.

A number of varieties of grasses have also been tested on these dry land farms. After a good preparation of the seed bed, brome grass at the rate of 40 lbs., tall oat grass and orchard grass, each at the rate of 25 lbs., and Giant rye grass and bunch grass, each at the rate of 12 lbs. per acre, were sown about April 15, 1904. Orchard grass failed to produce a crop. Brome grass led on the 5 farms, with a yield of 1,895 lbs. of hay and 465 lbs. of seed per acre for the Juab County farm in 1906, 1,600 lbs. of hay for the Iron County farm in 1905, 1,800 lbs. for the San Juan farm in 1906, 801 lbs. for the Washington County farm in 1906, and 700 lbs. of hay on both the Sevier and Tooele farms in 1906. Tall oat grass ranked next in yield. Giant rye and bunch grass, two native species, were grown only on the Sevier farm, at an elevation above 7,000 ft. Giant rye produced per acre 650 lbs. and bunch grass 550 lbs. of hay in 1906, both outyielding brome grass and tall oat grass.

The yields of rye on three of the farms varied during the 3 years from 4.52 bu. per acre to 20.6 bu. On the San Juan farm emmer yielded 16 bu. per acre in 1905 and 31 bu. in 1906. A yield of 13.5 bu. per acre is recorded for field peas, 124 bu. for potatoes, and 3,531 lbs. per acre for turnips.

The tabulated results of a plowing test show that the highest yield of wheat obtained on any of the farms was 32.6 bu. from a plat on the Juab farm plowed 5 in. deep. The highest average yield for 3 years, 21.68 bu., was also obtained from land plowed 5 in. deep, while the highest average yields on the Sevier and Washington County farms, where the precipitation was very light, were 7.19 and 7.25 bu., respectively, on land subsoiled 20 in. deep. The advantage from deep plowing and subsoiling is apparently dependent upon the season and upon the soil and general climatic conditions of the section in which it is practiced. Where the annual precipitation fell below 12 or 13 in. very low yields were secured even on summer fallow, yet in most instances where the rainfall exceeded 15 in. summer fallow gave the best yields. With reference to the distribution of the rainfall, it is believed that it is almost necessary to have at least 4 in. of the annual precipitation during the growing period.

Dry farming in the Great Basin, C. S. Scofield (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 103, pp. 43, pls. 4, figs. 8*).—This bulletin gives a general description of the region, reviews experiments in dry farming as carried on by private parties and by the State of Utah on its arid experiment farms, and considers the local conditions which affect dry farming, together with the methods of interseason tillage and the crops grown.

Dry farming in the Great Basin is limited at present almost entirely to Utah, where it has been carried on since 1875 and where the practice has been increasing rapidly since 1900. In this region the precipitation comes during the autumn, winter, and spring months, while on the dry lands east of the Rocky Mountains it comes during the summer. Farming is successfully carried on with an annual average rainfall of about 15 in. Clean summer fallowing and cropping the land every alternate year, together with thorough tillage, are considered the basis of successful dry farming in this section. The most important crops grown are wheat and alfalfa, and thin seeding is found essential to the best results. Under the best methods of tillage the land apparently remains highly productive, even where no other crop than wheat is grown. At present dry farming is used only as a supplement to irrigation farming and its independent extension is considered as depending upon the development of underground water for domestic use.

Agronomy department, A. ATKINSON (*Montana Sta. Rpt. 1906, pp. 158–167*).—The average results of a 2 years' test with 23 varieties of barley showed that Guy Mayle, a dark kerneled hulless variety, gave the largest yield. New Zealand, a 2-rowed high-grade brewing barley, stood second. The hulless varieties produced the largest quantity of feed. The 2-rowed varieties gave much larger yields than the 6-rowed varieties, and in the 6-rowed sorts large yields of grain were associated with large yields of straw. The average results show a yield of 1.26 lbs. of straw for each pound of grain in the 2-rowed varieties, 1.31 lbs. of straw to each pound of grain in the 6-rowed varieties, and 1 lb. of straw to each pound of grain in the hulless barley. Early maturing varieties gave in general light yields.

The average results of 2 years' test with 23 varieties of spring wheat are reported. Glyndon 692, a red milling wheat, stood first with a yield of 57 bu. per acre. This variety, together with Glyndon 650 and Glyndon 715, was originated by the Minnesota Experiment Station and all appear to be valuable for Montana. Wild Goose, of Canadian origin, stood second with a yield of 55.7 bu. and seems to be well adapted to both dry and irrigated lands. In yield of grain the common milling wheats and the durum varieties were about equal, while spelt and emmer, which are referred to as feeding wheats, gave much lower yields. The common wheats produced the most straw and spelt and emmer the least. The durum wheats were the quickest in ripening and gave the greatest weight per bushel.

Of 34 varieties of oats Progress, Swedish Select, and Siberian, as in earlier experiments, were the highest yielders. The varieties tested had an average of 24.75 per cent of hull, being over 5 per cent below the average of varieties generally grown. Salzer Big 4 had as low as 20 per cent of hull, while Sparrowhill had 29.8 per cent.

Seed of Reid Yellow Dent corn from northern Iowa was planted from May 12 to 16 on different farms in the Yellowstone and the Bitter Root valleys. Some ears showed almost perfect maturity by October 10. Seed was selected for next year's planting. It is believed that this variety can be perfectly acclimated in from 3 to 5 years.

Alfalfa was grown with and without a nurse crop. The first year oats used as the nurse crop yielded 83 bu. per acre, but no hay was made on any of the plats. The second season the yields of alfalfa hay were practically identical on the different plats, so that up to this time the value derived from the nurse crop is limited to the yield of oats secured the first year.

Experiments with Indian corn, forage crops, leguminous crops, J. H. SHEPPERD and O. O. CHURCHILL (*North Dakota Sta. Bul. 76, pp. 339–376*).—Over 120 varieties of corn have been under test. Of 22 varieties grown for several years, N. K. & Co. fodder corn ranked first as to fodder with a yield of 9,224 lbs. per acre, and Dutton first as to ears with a yield of 2,640 lbs. per acre. The average yield of all the varieties was 5,431 lbs. of fodder and 2,069 lbs. of ears. The early varieties gave as large yields as the late ones, and the large fodder varieties did not surpass the early maturing sorts. The fodder varieties did not produce mature enough ears to permit of harvesting them separately any season during the 6 years' experiments. The smaller acclimated varieties like Gehu, Mercer, Golden Dent, and others made a more rapid and stronger growth during the early part of the season than the large fodder corns. The results with varieties of sorghum, cane, Kafir, and broom corn during 12 years show that they are not as valuable a crop for fodder production as the common varieties of Indian corn.

Shallow cultivation gave an average yield for 6 years of 35.4 bu., as compared with 34.5 bu. for shallow early and deep late cultivation, 31.5 bu. for deep early and shallow late cultivation, and 30.3 bu. for deep cultivation. In every year the corn on the plat receiving shallow cultivation was ripest when frost came, When drilled in 6 in. drills, planting on May 27 and June 9 gave better average yields than planting June 19 and 30. Corn drilled in 42 in. drills did not give such high yields as corn drilled in 6 in. drills, but it was more easily harvested and it also produced a considerable part of its value in the ears which it formed. In a test with planting different numbers of kernels per hill it was observed that the yield of fodder increased with the thickness of planting, while the greatest yield of ears was made by the plat having 4 stalks per hill. Corn drilled 6 in. apart led in average yield of fodder for 8 years with 7,843 lbs. per acre, while corn planted in drills 42 in apart led in yield of ears with 25.2 bu. per acre, the corn being in the hard dough to ripe condition when harvested.

A comparison of different distances between kernels of corn in rows 44 in. apart shows that stalks growing at intervals of 6 in. gave better returns of both ears and fodder than when grown at greater distances, the yield decreasing regularly as the distance widened. Of corn fodder grown in 6 in. drills cattle consumed during a 32-day feeding test 92.6 per cent of the forage offered them, while of the fodder grown in rows 42 in. apart only 82.8 per cent was consumed. Analyses made of fine and coarse corn fodder showed but little difference in the value of the refuse rejected by the cattle, although that from the thick grain sample was slightly superior. Corn grown in 6 in. drills produced 8,174 lbs., and that grown in 42 in. drills 5,570 lbs. per acre.

In brief notes on different crops it is recorded that field peas in 1906 yielded 31.5 bu. per acre, and that cowpeas and soy-beans had not given much promise. A heavy dressing of decomposed barnyard manure on brome grass seeded in 1902 gave a yield of 2.75 tons of hay per acre, as compared with 1.96 tons for the check test. It is believed that the reduced yields of brome grass after it has stood for a few years is due as much to the reduced fertility of the soil as to the density of the sod. Grimm and Turkestan alfalfa have produced on an average for 5 years 5,051 lbs. of hay per acre. The average yield for 7 years of medium red clover from the first cutting was 3,547 lbs. The plat giving the highest yield of red clover seed lacked only 4 lbs. of making 2½ bu. of seed per acre. Clover sown with and without a nurse crop showed no differences during any period of the following growing season.

Alfalfa in Maryland, C. W. Nash (*Maryland Sta. Bul. 118, pp. 291–314, figs. 7*).—General directions for the culture of alfalfa in Maryland are given, and the results secured in cooperative tests with farmers are summarized. The reports received show yields ranging from 2½ to 7 tons per acre. One farmer reported a yield of 5 tons per acre on a field of 66 acres seeded 12 years ago. The results of inoculation tests showed the value of using alfalfa and sweet clover soil for this purpose.

Of the farmers reporting, 122 had good stands at the time of making their reports while 36 had been unsuccessful. Of the successful parties 91 used manure, 66 lime, 57 commercial fertilizer, 39 commercial fertilizer and lime, 52 manure and lime, 33 manure and lime and commercial fertilizer, 7 a nurse crop, 41 soil inoculation, and 82 seeded in the fall.

Indian corn, its production and improvement, G. A. Crosthwait (*Idaho Sta. Bul. 57, pp. 59, pls. 11*).—This bulletin, a treatise on corn culture, discusses corn culture, seed corn, and corn improvement, together with the work in this line carried on at the station. The selection and preservation of seed corn and the methods of making germination tests are described, and the rules of exhibiting corn in Idaho, the score card, and the rules of judging are given in detail. The varieties of corn tested at the station from 1904 to 1906, inclusive, are enumerated, and the progress of the work in selecting strains adapted to Idaho conditions is mentioned.

The selection of seed corn, C. G. Williams (*Ohio Sta. Circ. 71, pp. 8*).—This circular discusses the selection of seed corn with reference to the time of selection, condition of the plant, weight, length and position of the ear, and its care after gathering.

Selecting seed corn in the fall before the crop is harvested is advised. In the experience of the station, seed selected from plants where the stand and other environment was normal gave an average yield of 3.23 bu. per acre more than seed selected in the ordinary way, and heavy weight seed ears exceeded medium weight seed ears in yield by 5.9 bu. per acre, while medium long seed ears exceeded medium short seed ears by 4.85 bu. per acre. It was observed that vigor of plant, as shown by ability to stand upright, is hereditary. Ear rows growing side by side gave a variation of from 0 to 56 per cent of broken plants.

Descriptions and classification of varieties of American upland cotton, J. F. Duggar (*Alabama College Sta. Bul. 140, pp. 142, pls. 36, figs. 35*).—For the purpose of classification the short staple or upland varieties of cotton are grouped as follows: Cluster varieties, or Dickson type; semi-cluster varieties, or Peerless type; Rio Grande varieties, or Peterkin type; King-like varieties, or King type; big boll varieties, or Truitt type; long limb varieties, or Petit Gulf type; intermediate varieties, or various types; and long staple upland varieties, or Allen type. Each one of these groups as well as a long list of individual varieties is described. Tables are given showing the number of bolls required to make 1 pound of seed cotton, the arrangement of varieties according to percentage of lint, and the weight of 100 seeds.

In experiments on productiveness, among the varieties tested at the station for a considerable number of years, Peerless, Peterkin, Russell, and Truitt have frequently stood near the top of the list. Of those tested only a few years, Cleveland, Cook Improved, Jackson, Layton, Pullnot, and Toole have given good results.

Sea Island cotton: Its culture, improvement, and diseases, W. A. Orton (*U. S. Dept. Agr., Farmers' Bul. 302, pp. 48, figs. 13*).—This bulletin discusses the geographical distribution of Sea Island cotton in the United States, the ideal crop requirements, the possible extension of the Sea Island cotton-producing area, markets, farm practices, cultivation, fertilizers, preparation of the land, seed selection, handling the crop, and the diseases and insect enemies which commonly attack the plant.

A, B, C of cotton planting, D. Morris (*Imp. Dept. Agr. West Indies, Pamphlet 45, 1907, pp. 98, figs. 5*).—This is an enlarged edition of a former publication on this subject, previously noted (E. S. R., 16, p. 152).

Bermuda hay (*Oklahoma Sta. Rpt. 1906, p. 21*).—Experiments at the station with Bermuda grass have shown that this species is not only adapted to pasture but is also of value as a hay crop. Two and one-half acres of upland soil planted to hardy Bermuda grass June 29 and 30, 1905, produced at the rate of 5.08 tons per acre from three cuttings in 1906.

Growing and curing hops, W. W. STOCKBERGER (*U. S. Dept. Agr., Farmers' Bul. 304, pp. 39, figs. 20*).—This bulletin considers the conditions essential to hop growing, and the propagation, planting, cultivating, pruning, harvesting, curing, baling, and marketing of the crop.

Trials of oats, J. SPEIR (*Trans. Highland and Agr. Soc. Scot., 5. ser., 19 (1907), pp. 177, 178*).—The 3 varieties tested in 1905 gave the following yields: Potato, 54$\frac{4}{40}$ bu., Universal, 59$\frac{3}{40}$ bu., and Wide Awake, 74$\frac{31}{40}$ bu. per acre. The different varieties are briefly described.

Experiments in crossing potatoes, J. H. WILSON (*Trans. Highland and Agr. Soc. Scot., 5 ser., 19 (1907), pp. 74–92, figs. 16*).—Discussions are presented on certain botanical features of the potato, the deterioration of varieties, variation, fruiting, and the production of seedling potatoes, together with notes on grafting and crossing.

The author secured crosses of British Queen and Myatt Kidney, New Zealand Red variety and Myatt Kidney, and Maincrop and New Zealand Red variety, the last-named in each case being the pollen parent. *Solanum commersoni* was crossed with the ordinary potato, but the resulting fruits were seedless.

Sugar beets, V. K. CHESNUT (*Montana Sta. Rpt. 1906, pp. 135–138*).—Coöperative culture tests with sugar beets were made in the Gallatin Valley and analyses of 39 samples showed an average sugar content in the juice of 16.9 per cent, a purity of 84.05 per cent, and an average weight per beet of 29.6 oz.

Comparative results from European and American beet seed showed that the beets from American seed ranked among the first in sugar content and purity.

Seedling canes and manurial experiments at Barbados, 1904–6, J. P. D'ALBUQUERQUE and J. R. BOVELL (*Imp. Dept. Agr. West Indies, Pamphlet 44, 1907, pp. 133*).—The seedling and other canes grown in these experiments were grown on 13 estates situated in typical localities on the island, 11 of the plats being on black soils and 2 on red soils. On the black soils, as plant canes, D. 95 gave the best results, yielding 9,216 lbs. of saccharose per acre, as against 6,876 lbs. from White Transparent. D. 95 was followed by B. 1529, B. 147, D. 1438, B. 376, and B. 208 in the order named. On the red soils, as plants and rattoons, B. 1566 led in yield with 9,811 lbs. of saccharose per acre, as compared with 6,199 lbs. for White Transparent. B. 376, D. 95, B. 208, and B. 1529 also gave good results.

For the years 1900 to 1906, B. 1529, B. 147, and B. 208 gave the highest returns as plants on the black soils, the increase representing $17.64, $5.37, and $4.29 per acre, respectively, as compared with White Transparent. As plants and rattoons taken together, B. 208 averaged 5,339 lbs. of saccharose per acre, as against 5,029 lbs. from White Transparent. On the red soils, as plant canes, B. 1566, B. 1529, and B. 208 gave the best results. As plants and rattoons taken together, B. 1566 and B. 376 gave increased values per acre of $22.52 and $10.86, respectively, as compared with White Transparent.

The results of the fertilizer experiments indicate, in general, that larger yields are obtained by supplementing an ordinary application of barnyard manure with commercial fertilizers than by applying manure alone, and also that an application of nitrogen both to plant canes and rattoons gives a profitable increase in yield. The results with potassic and phosphatic fertilizers were not in accordance with previous years, the application of superphosphate giving a slightly increased yield, while the potash fertilizers did not prove profitable.

The estimation of cane crops, C. H. HAMAKERS (*Internat. Sugar Jour., 9 (1907), No. 102, pp. 287–291*).—A cane field of about 2.5 acres, cut up into 100 rectangles by intersecting irrigation canals, was used for the experimental estimation of its yield. Each of the rectangles was 24 ft. long and contained 15 rows of cane. In each of these the diameter of 10 adjacent cane stalks was determined in centimeters, and with these results as a basis the yield was calculated.

It was further found that a fair average could be deduced without measuring so many stalks, the difference between the approximate and the true averages of the diameter of the stalks not exceeding ½ mm.

In the application of the system the number of cane stalks per acre is estimated by counting the stalks in a few of the 24-ft. plant rows, and by measuring the average height of the stalks at a point where the stalks are erect. In this way it is considered possible to obtain a fairly accurate estimate of the weight of the crop.

The relation of the composition of the leaf to the burning qualities of tobacco, W. W. GARNER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 105, pp. 27*).—In summarizing the results obtained by different investigators in their studies of the burning qualities of tobacco, it is pointed out that only two facts have not been disputed, the one that chlorin injures the fire-holding capacity and the other that potash favors this property. These two facts are insufficient to explain the differences in the burning qualities of tobacco, and the author in his experiments worked with a view to determine the effects of sulphates and phosphates and the relative value of the different salts of potash in promoting the fire-holding capacity.

The tobacco samples, all of which had been thoroughly fermented, were extracted with various solvents and the effect on the burning qualities noted. In various samples extracted with petroleum ether and with ordinary ethyl or sulphuric ether the burning quality was not appreciably affected, and the same result was secured when strong alcohol was used as a solvent, except in one case where the fire-holding capacity was considerably improved by the extraction.

It is pointed out that the active principle or principles imparting fire-holding capacity to the leaf can be extracted with water, and that the problem is narrowed down to the determination of the composition of the extract and the discovery of which of the constituents contribute to the burning qualities. With this object in view, 100 gm. of tobacco having a good burn was extracted with 1 liter of distilled water, the extract being poured off and the tobacco again extracted with the same quantity of water for 24 hours longer. The principal constituents of these extracts were the chlorid, sulphate, nitrate, citrate, and malate of potassium, together with ammonium and nicotine salts and small quantities of lime and magnesia. An examination of the ash of the extracted tobacco showed that practically all of the phosphoric acid, about one-half of the magnesia, all of the oxalic acid, and the greater portion of the lime remained in the leaf, while the extract contained nearly all the chlorid, all the potash, and the malic, citric, and nitric acids, and most of the sulphuric acid. About one-half of the total ash was extracted from the leaf by this process, and this seemed to contain all the constituents imparting to the tobacco its fire-holding capacity.

An extract of tobacco having poor burning qualities was prepared in the same way. This also showed the power of imparting fire-holding capacity, but as nearly as could be determined this power was only about one-fifth of that of the other extract. The extract from the poorer tobacco contained about 5 times as much sulphuric acid, twice as much magnesia, and considerably less nitric acid than the extract from the tobacco with good burning qualities. "The total quantity of potash was about the same in the two extracts, so that the extract from the tobacco with poor burning qualities contained much less potash in combination with the organic acids. The difference in composition of these extracts, then, obtained from tobaccos having good and bad burning qualities, indicates that the principal factor favoring the burn is the potash in excess of the amount required for combining with the mineral acids."

The effects of potassium, calcium, magnesium, and mineral and organic acids of the ash on the burning qualities are discussed and the character of the ash, together with the relation of organic constituents to the burning qualities, is described.

In the summary of his work the author points out that the fire-holding capacity is dependent primarily on the content of potash combined with organic acids; that lime in general does not affect the fire-holding capacity, but is an essential factor in the production of good ash; that large amounts of magnesia tend to injure the capacity for fire-holding; that chlorin injures the burning qualities, but seldom is present in sufficient quantities to do any serious harm; and that sulphates in general injure the burning qualities, but that the effects are less marked when all the sulphuric acid is combined with potash. It is further pointed out that so far as known none of the organic constituents of tobacco, with the possible exception of the so-called tarry acids and the albuminoids, exert a very important influence on the burn.

"From these conclusions it appears that the principal objects to be attained in efforts to improve the burning qualities of tobacco by breeding and by improved methods of production, especially in the use of the proper fertilizers, are (1) a relatively high content of potash combined with citric and malic acids, with a minimum amount of inorganic salts, especially chlorids and sulphates; (2) a moderate content of lime; (3) a comparatively small percentage of magnesia, and (4) a low content of organic nitrogenous compounds, more especially the albuminoids or proteids."

The improvement of fire-cured tobacco, G. T. McNess, E. H. Mathewson and B. G. Anderson (*Virginia Sta. Bul. 166, pp. 191–234, figs. 8*).—This bulletin is based on the results of cooperative work of the Virginia Experiment Station and the Bureau of Soils of this Department. The plan of the experiment as well as the results for 1904 have already been noted from another source (E. S. R., 18, p. 235). The cultural history of the dark shipping type of tobacco in Virginia, the climate and soil required by the crop, and the results of experiments made in 1904–1906, inclusive, are discussed, and the methods of cultivating and handling dark tobacco which the investigators found to be best in their general experience as well as in their experimental work are described.

The work was carried out on 3 one-acre plats. Plat No. 1 received 400 lbs. of factory mixed fertilizer containing 12 lbs. each of ammonia and potash and 36 lbs. of phosphoric acid. Plat No. 2 was treated with 850 lbs. of a home mixture furnishing 73.5 lbs. of ammonia, 57 lbs. of phosphoric acid, and 75 lbs. of potash, and plat No. 3 was given 1,700 lbs. of a home mixture supplying 153 lbs. of ammonia, 106 lbs. of phosphoric acid, and 125 lbs. of potash.

In the fall of 1904 the plats were sown to rye as a winter cover crop. On the 2 heavy fertilized plats the rye had grown too tall for turning under, and hence rye hay was made before plowing. Owing to good moisture conditions, early transplanting, a healthy continuous growth, and the improvement in soil fertility resulting from the more intensive methods employed, good yields were secured in 1905. Plat No. 1 yielded 842 lbs. of tobacco, produced at a cost of $45.04 and sold for $60.13. Plat No. 2 produced 1,296 lbs. of tobacco and 1,000 lbs. of rye hay, at a cost of $68.47, which sold for $104.61; while plat No. 3 yielded 1,527 lbs. of tobacco and 2,000 lbs. of rye hay, produced at a cost of $90.77 and selling for $134.59. Disregarding the rye crop, plat No. 1 showed a profit of $15.19, plat No. 2 of $36.34, and plat No. 3 of $40.42, as compared with $4.64, $19.94, and $28.41, the profits, respectively, the year before.

The following season winter wheat grown as a cover crop was plowed under early in May. The amount of vegetable matter turned under on plats Nos. 2 and 3 was several times greater than on plat No. 1. The season of 1906 being wet, subsoiling 6 to 10 in. deep after plowing 6 in. deep produced no effect. The crop grew with much promise until the middle of August, when continued wet and cloudy weather caused the leaves to speck badly and very much reduced the yield and quality of the tobacco. It was observed that on the heavy fertilized plats the leaves did not speck more and the lower leaves showed a lesser tendency to yellow than on the lighter fertilized plat. This year plat No. 1 yielded 529 lbs. of tobacco, produced at a cost of $39.03 and selling for $34.15. Plat No. 2 yielded 922 lbs., at a cost of $60.15 and selling for $59.91, while plat No. 3 produced 1,305 lbs. of tobacco at a cost of $83.49, which sold for $85.37. These poor results were entirely due to the unfavorable weather conditions.

In view of the results of the three years' work, the Virginia Station and the Bureau of Soils "feel justified in asserting that under proper conditions it will be of financial benefit to the farmers in the dark belt of Virginia to use fertilizers much more liberally on their tobacco than they have been accustomed to do. . . . A soil suitable for growing a fairly good quality of tobacco should be chosen. It should possess reasonably good depth and mellowness, so as to be easily tilled, and have a proper water-holding capacity. . . . Good cultivation and handling are also necessary to make a success of a tobacco crop."

The cultivation of turmeric (*Oil, Paint and Drug Reporter, 71 (1907), No. 22, p. 29*).—Brief directions are given for the culture of this crop, and its market value is discussed.

Swedish plant breeding at Svalöf (*Svensk Utsadesförädling På Svalöf. Goteberg, 1907, pp. 94, pl. 1, figs. 49*).—A detailed description of the Swedish plant breeding station at Svalöf and of the methods in vogue at the institution.

HORTICULTURE.

Horticultural department, R. W. FISHER (*Montana Sta. Rpt. 1906, pp. 142–154*).—The results are here given of the work conducted during the year, including data on fruit-thinning experiments and variety and cultural tests with vegetables, ornamental trees, and shrubs.

The experiments to determine the relative value of thinning fruit on apple trees (E. S. R., 18, p. 441) were continued during the year, but owing to the uniformly light crop the results obtained did not show a very material increase in the size of the apples. In one orchard the cost of thinning the fruit on 12-year-old Wealthy trees was 2⅘ cts. per tree, or $2.52 per acre. When the apples were harvested there appeared to be no difference in the size or color of the fruit from thinned and unthinned trees. In another orchard in which the trees were larger and produced a heavier crop than in the first case the cost of thinning fruit was 4⅗ cts. per tree, or $5.40 per acre. The thinning in this orchard increased the size of the fruit about 10 per cent, and on trees very heavily loaded is said to have made the fruit of a marketable size where otherwise it would have been too small.

As a result of the experiments thus far conducted by the department and from the experience of fruit growers throughout the State, the conclusion is reached that it pays to thin the apples on trees which are heavily loaded. Thinning increases the size without decreasing the total weight and also prevents mechanical injury to the tree by distributing fruit more evenly. The experience of many successful fruit growers has determined that it is best to thin when danger of severe frost has passed and before the fruit has grown larger than a hazelnut, although the author believes that thinning should be done more or less throughout the growing season.

The results from the variety tests with beans are tabulated, showing the varieties grown, the yield and quality of each variety, and the dates of picking, with the total weight of the crop. The largest yields of snap beans were produced by the Long Yellow Six Weeks, Goddard, Early Mohawk, and Golden Wax. Of the green snap beans the varieties of best quality regardless of yield were Long Yellow Six Weeks and Longfellow; of the Yellow or wax snap beans, the Valentine wax and the Keeny Rustless Golden wax. Early Warwick was the earliest variety tested, producing the first snap beans.

The results secured with cabbages are also tabulated. The varieties producing the largest yield of good quality, solid heads, and of late keeping were Acme Flat Dutch, Danish Round Head, Danish Ball Head, and Succession.

With tomatoes a table is given showing the varieties ripening the first fruits and the amount of ripe and green tomatoes produced during the season on both pruned and unpruned plants. Burpee Earliest Pink gave the largest amount of ripe fruit before the plants were killed by frost. Except in 2 cases the plants pruned to 1 stem produced a much larger amount of ripe tomatoes than the plants not pruned. The varieties yielding the largest amount of ripe tomatoes of good quality were Sparks Earliana, Earlibell, and Burpee Earliest Pink, which varieties also ripened the first fruits and are recommended for early planting in high altitudes in Montana.

The work with onions conducted at the station has been published in bulletin form (E. S. R., 18, p. 39).

A large number of ornamental trees and shrubs secured from this Department, various State experiment stations, and other sources have been tested on the station grounds, and a table is given including the scientific and common names, with notes on the hardiness of each variety. There is also a separate list of those plants which have proven hardy in the trial nursery.

Report of the horticulturist, F. GARCIA (*New Mexico Sta. Rpt. 1906, pp. 44–55*).—An outline is given of investigations conducted during the year, together with tabular data on commercial fertilizer tests with onions, and notes on cultural tests with Irish and sweet potatoes and peanuts.

The results of the fertilizer experiments with onions are considered unsatisfactory since the crop suffered from adverse weather conditions. It appears from the work with Irish potatoes that they are not adapted to valley conditions in New Mexico. The sweet potato tests have given satisfaction although the crop suffered from scarcity of water and a severe hailstorm. The yield from 1.53 acres was 7,081 lbs. and the cost of digging and hauling $5.60.

Second annual report of the Ontario vegetable growers' association, 1906 (*Ann. Rpt. Veg. Growers' Assoc. Ontario, 2 (1906), pp. 68*).—This report consists chiefly of a collection of papers and prize essays on the culture of different varieties of vegetables, together with the discussions following.

Melon culture, F. GARCIA (*New Mexico Sta. Bul. 63, pp. 38, figs. 10*).—This bulletin contains popular directions for the cultivation of watermelons and canteloupes in New Mexico, together with the results of investigations with these crops at the station. A discussion is given of the soil, methods of planting, cultivation, irrigation, and harvesting, together with notes on insects and diseases and their control.

The experiments conducted at the station consisted of variety and cultural tests. The cost of production, exclusive of the cost of seed and picking, was $18.40 per acre for watermelons and $16.69 for muskmelons. Phinney Early, Cuban Queen, Mammoth Iron Clad, Gypsy or Rattlesnake, and Florida Favorite were the most satisfactory varieties of watermelon in the test. The Rockyford is the most satisfactory general purpose canteloupe, although the Netted Gem, Osage, Netted Nutmeg, and Hackensack are also considered quite satisfactory.

First report on the fruit experiments at Pusa, A. HOWARD (*Agr. Research Inst. Pusa [India], Bul. 4, 1906, pp. 40*).—During the past season a series of experiments was begun at the Agricultural Research Institute at Pusa for the purpose of obtaining information with regard to the growth and management of fruit trees. This report deals with the first year's work, including an account of the establishment of the orchard, and an outline of the experiments in progress.

Lists are given of all the fruit varieties in the experimental orchards, including citrus fruits, peaches, plums, custard apples, loquats, guavas, mangoes, figs, bananas, pomegranates, and litchis, together with a row of mixed trees of several other varieties of fruits. Plans are given of the different orchard plats, together with brief notes on the experiments to be undertaken, these to consist of variety and cultural tests and experiments in planting, pruning, and weathering.

In the case of the citrus fruits a series of stock experiments is also being conducted to determine the effect of different stocks on the development of the plant and the character of the fruit.

Marketing Hawaiian fruits, J. E. HIGGINS (*Hawaii Sta. Bul. 14, pp. 44, pls. 8*).—The station has undertaken experiments to determine what fruits can be successfully shipped to the mainland, as well as to investigate methods of packing and shipment and to introduce new kinds of fruit into the market. This bulletin contains a report of experimental shipments of pineapples, avocados, and papaias made in August, 1906.

The pineapples included in these experiments were secured from 2 of the leading growers, part coming from the lower, dark-colored soils and the remainder from the higher red lands. The fruits of one lot were gathered July 29 and allowed to cure for a day before packing. All the other fruits were gathered on July 29, packed the same day, and shipped the following morning from Honolulu. Nearly half of the shipment was subjected to fumigation with formaldehyde gas in order to determine its effect on the arrest of the development of fungi in the fruit. From a portion of the fruit the bracts were removed and the remainder was shipped with long stems. A part of the fruit was wrapped in paper with the ends closed and the rest with the ends open. Various sized crates were used and part of the shipment was placed in transit in the "'tween decks" and part on the main deck. The shipment started from Honolulu on August 1 and arrived in Portland, Oreg., on August 9, when the fruit was inspected.

The results are tabulated and are summarized in substance as follows: With regard to the use of excelsior as compared with hay as a medium of packing, both the fumigated and unfumigated stock carried much better in the hay. In both the fumigated and unfumigated stock the results are very markedly against the practice of pulling off the bracts. The fruit shipped with long stems gave much better results. Fruit wrapped in paper with the ends closed and those with the ends open gave practically the same percentage of loss in the case of unfumigated stock and a reduction in loss as compared with the check lot of 10.8 per cent. With the fumigated stock the loss was much greater in the case of fruits wrapped with paper in which the ends were closed. This is attributed to the inability of the fumes of the formaldehyde to reach the fruit. The fruits which were allowed to cure in the packing house for one day appeared to have shown a very slight disadvantage, although this experiment is not sufficiently complete to warrant a definite conclusion. On the whole, there was a marked diminution in the loss when the pineapples were fumigated with formaldehyde. In regard to the fruit from dark soils as compared with that from red soils, the results thus far suggest that the fruits from the lower dark fields may be more subject to decay than those from the upper red fields. With fruit placed between the decks the loss was much heavier than on the main deck, running up to the proportion of 42.8 per cent in the case of unfumigated stock.

Shipments of avocados were also made at the same time, the fruit having been submitted to cold storage previous to shipment. The results indicate that it is possible to ship this fruit to direct markets without greater loss than is experienced in average fruit shipments. Directions are given with regard to picking, grading, wrapping, packing, crating, and shipping avocados. The degree of temperature which is best for the preservation of avocados in transit has not been determined, although experiments made at the station show that prolonged storage in temperatures such as are used for peaches, grapes, plums, etc., result in the blackening of the interior of the avocado. It is recommended that the mercury should not fall below 40° F. Shipping on deck without refrigeration has not proved successful.

Tabulated results are given of the trial shipments of papaias. The fruit of the long type is considered better for shipping than the round, since this shaped fruit can be packed more securely, thus preventing the motion of the fruit within the crate. At the present stage of the investigation it is suggested that fruit which is beginning to show indications of ripening be shipped to such ports as San Francisco or others which are reached by direct journey. Fruit which is gathered green does not acquire as fine a color as that which has started to ripen on the tree, though it will become ripe and marketable if fully grown. Brief suggestions are given for the preparation, refrigeration, style of crates, and shipment of papaias.

The author discusses the source of supply and market possibilities of bananas, and is of the opinion that all of the markets west of the Great Plains might be supplied with bananas grown in Hawaii. Efforts are being made to introduce the Hawaiian cooking bananas, which are said to take the place of fresh vegetables and cooking fruits.

No shipments have thus far been made with mangoes, although they have been found to keep much longer than avocados under refrigeration without deterioration in quality. It is believed that the mango industry will become important in Hawaii when the demand for this fruit increases, provided some immediate and stringent action on the part of the Government is taken in the destruction of the mango weevil (*Cryptorhynchus mangiferæ*), which at the present time threatens the industry.

In conclusion, the author discusses the present system of marketing by commission and consignment, which he considers entirely unsatisfactory.

Seedless apples (*Wis. Hort. Soc. Bul. 11, pp. 11, figs. 4*).—In this bulletin the opinions of several well-known horticulturists are given with respect to the relative value of the Spencer seedless apple.

In general it appears that while the Spencer apple is usually seedless, "an occasional seed being found near the calyx, and sometimes just under the skin," it is by no means coreless and is inclined to be wormy. Several reports from nurserymen are given with reference to the cost of good trees of standard apples in Wisconsin, from which it appears that 6 good standard trees can be bought for $2, the price of 1 Spencer seedless apple. The latter variety is considered only a novelty and worth only a fraction of this price.

Fig culture, E. STEARNS (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 8, pp. 33, pls. 8*).—This is a popular treatise on fig culture, including notes on the history, climatic and soil conditions, cultural operations, harvesting, curing, packing, shipping, and marketing, together with an account of the culture of Smyrna figs, the introduction of the Capri or wild fig, and the naturalization of the *Blastophaga grossorum*, by means of which the Smyrna fig is caprified or fertilized. The subject-matter is based principally on data secured from fig culture in California and furnished largely by G. C. Roeding, whose publication on the Smyrna fig has been noted (E. S. R., 15, p. 366).

Fall delivery of fruit trees (*Oklahoma Sta. Rpt. 1907, pp. 19–21*).—Popular directions are given for receiving and protecting fall-delivered fruit trees, together with instructions for transplanting. It is advised that the trees be unpacked and inspected before being accepted.

The factors which determine the quality of tea, H. H. MANN (*Indian Tea Assoc.* [*Pamphlet*] *4, 1907, pp. 29*).—This report is based on an address delivered by the author at several planters' meetings in India, the data being taken for the most part from various publications by the author on tea culture and manufacture (E. S. R., 19, p. 238).

The various factors said to affect the culture of tea are briefly considered, including the effect of elevation and latitude, regularity and sufficiency of rainfall, variety of plant, special character of soil and manuring, kind of pruning, method of plucking, and system of manufacture, including withering, rolling, fermentation, and firing.

Tea planting companies (*Economist, 65* (*1907*), *No. 3330, pp. 1060, 1061*).—General statements and tabular statistics are given with reference to the results of 18 tea planting companies in India and Ceylon. With all but 2 companies the earnings for 1906 increased over those of 1905. According to figures provided by the Board of Trade returns, with regard to the statistics of British foreign trade for 1906, it appears that the amount of tea taken from China had decreased by 13,352,087 lbs. in the past 2 years, while the increase in imports of tea from India during the same period amounted to 13,452,235 lbs. From this it appears that Indian producers are gaining what the Chinese are losing.

Bush fruits, W. T. MACOUN (*Canada Cent. Expt. Farm Bul. 56, pp. 67, pls. 4, figs. 7*).—This is a general and popular bulletin dealing with the history, cultivation, varieties, and insects attacking the currant, gooseberry, raspberry, and blackberry. The work is based principally upon variety tests and cultural experiments conducted at the Central Experimental Farm during the past 20 years. All of the varieties tested at the station are listed and descriptions are given of the most promising varieties, including 45 varieties of currants, gooseberries, and raspberries originated by W. Saunders. Lists are also given of varieties recommended for planting, together with considerable data with regard to yields of currants and raspberries secured in the station trials.

Descriptions are given of the insects injurious to fruits, with remedies for the same by J. Fletcher. The work concludes with a historical sketch of the work of W. Saunders in improving the currant, gooseberry, and raspberry.

A previous bulletin on raspberries, reporting the station work up to 1895, has already been noted (E. S. R., 7, p. 403).

Experimental work in the vineyard of the [Peru] National School of Agriculture, F. CHABERT (*Bol. Min. Fomento* [*Peru*], *4* (*1906*), *No. 12, pp. 1–8, map 1*).—An outline is given of the various lines of work either under way or to be conducted by the author and Señor Dubosc in the vineyard of the National School of Agriculture. Important investigations now in progress are the determination of the durability of different varieties of wood used for vineyard posts, experiments with different systems of pruning, and variety tests. Irrigation and fertilizer experiments are to be instituted, and an attempt is being made to arrive at some means of producing thoroughly matured wood on the vines.

India's poppy and opium, W. H. Michael (*Daily and Consular Trade Rpts.* [*U. S.*], *1907, No. 2932, pp. 1-3*).—A brief account of poppy culture and the preparation of opium for market in India. Deep plowing is said to be practiced for the poppy, whereas with other crops grown in India shallow plowing is the rule.

In the operation of sowing, the poppy seed is mixed with sand so that it will not be sown too thick, and one-third of the required amount is then scattered over the field, after which the field is watered. When the soil is sufficiently dry the land is again plowed more shallow than at first, harrowed, and another third of the seed sown. Similar treatment follows the second sowing, when the field is sown for the third time. Three pounds of poppy seed are required for 1 beegah or about ⅝ acre of land. The entire crop is purchased by the Government with the exception of small amounts, which are reserved for the use of the farmers.

The value of the opium export from India in 1906 is given as $30,640,080, of which $24,032,260 went to treaty ports in China. The Government pays $2.90 per seer (a little over 2 lbs.) for liquid opium, 8 to 10 cts. per seer for the dry cake, 4 to 6 cts. per bundle for the dry stalks, and 49 cts. per seer for seed in heads. Practically the entire crop is raised on small farms.

Lemon grass in Ceylon, H. Wright and M. K. Bamber (*Circs. and Agr. Jour. Roy. Bot. Gard. Ceylon 3* (*1906*), *No. 19, pp. 263-270b, dgm. 1*).—The cultivation of lemon grass in preference to that of citronella is said to be increasing in many parts of Ceylon on account of the high price at present paid for the pure oil of the former. This circular contains an account of experiments with lemon grass conducted at the Peradeniya experiment station since 1901, including a botanic description, the climatic and soil conditions, cultivation and distillation at the station, together with several reports on the physical and chemical properties of the oil obtained. A diagram is given of a citronella oil still.

In the past the cultivation of lemon grass has been confined to the southern parts of Ceylon, in places near sea level and supplied with a rainfall of 100 in. or more, and an average temperature of 80° F., but in the present experiments the grass has been successfully cultivated at an elevation of 1,600 ft., where the annual rainfall is about 82 in. and the mean annual temperature about 75.5° F.

Four seasons in the garden, E. E. Rexford (*Philadelphia and London, 1907, pp. 307, pls. 27*).—Popular directions are given for the making and care of lawns and of gardens of various kinds for different seasons of the year, including the winter window-garden, and greenhouse cultivation of flowers. Attention is also directed to the culture and care of bulbs, palms, and decorative plants, together with an account of the organization of a village improvement society and suggestions for forming such societies. The text is well illustrated.

A case of degeneration of tuberous plants, N. Bernard (*Bul. Soc. Linn. Normandie, 5. ser., 9* (*1905*), *pp. 251, 252*).—A brief note is given on the behavior of plants of 2 species of coleus (*C. coppini* and *C. daso*), which were sent from Lake Tchad, in the interior of Africa, to the botanical garden at Caen. The tubers of both species were grown in a temperate greenhouse and in the open ground, but in both cases failed to reproduce tubers. The plant grown in the open ground remained small and insignificant, while the plant grown in the greenhouse grew well and produced abundant roots. The author is of the opinion that this degeneration may be attributed more to the change of environment than to the change of climate.

The hybridization and propagation of orchids from seed, F. Ledien (*Möller's Deut. Gärt. Ztg., 22* (*1907*), *Nos. 18, pp. 206-216; 19, pp. 217-228; 20, pp.*

230–232, figs. 34).—This is an illustrated series of articles containing numerous observations on hybridizing, crossing, and propagating tropical orchids. The author states that it is a matter of constant occurrence that certain genera and species are found to be capable of greatly affecting, altering, or completely suppressing in their progeny the features of the species and genera with which they are crossed. Numerous examples of this occurrence are given.

The bagging of flowers (*Jardin, 21* (*1907*), *No. 486, p. 145*).—This is a brief note in regard to the recent experiment of M. Vilaire, of the Rouen botanical garden, on the bagging of lilac blooms. Several blooms scarcely in bud were bagged on March 24 last and came into full bloom on April 26, whereas the check blooms at the latter date showed only buds. These experiments are to be continued with other varieties of flowers.

A peony check-list, J. E. Coit (*Ithaca, N. Y.: N. Y. State Col. Agr., 1907, pp. 232, figs. 2*).—The author is conducting an extensive peony investigation for the purpose of remedying the existing confusion regarding the names of varieties, and of offering simple but complete and accurate descriptions of the same.

The present list comprises the information which has been gathered in connection with this work from books, periodicals, manuscripts, etc., and includes the leading varieties of peonies of which authentic descriptions can be found in horticultural literature. The varieties which have been found illustrated, together with the place thereof, and those varieties which may be found in the Cornell plats are all indicated. The list comprises 2,706 varieties and is introduced with a description of the Cornell system of alphabetical classification. In conclusion some general lists of varieties recommended are given.

Roses proof against mildew in Australia (*Gard. Chron., 3. ser., 41* (*1907*), *No. 1065, p. 333*).—In this note a list taken from the journal of horticulture of Australia is given of a large number of roses, which are said to be proof against mildew in that country.

FORESTRY.

Notes on the radial increment of tree trunks, O. Lignier (*Bul. Soc. Linn. Normandie, 5. ser., 9* (*1905*), *pp. 181–224*).—The author made studies of cross-sections of several species of trees belonging to the botanical collection at Caen, for the purpose of determining whether a satisfactory formula could be derived for computing the age of trees with the aid of the circumference. The results of these studies are discussed in detail, and the data obtained from each species with reference to its yearly-growth increment are presented in tabular form.

The more important general conclusions derived from this work are, in substance, as follows: The life of a tree may be divided into 2 periods, which vary according to the species. During the first period, or period of acceleration, the thickness of the annual rings increases from year to year. During the second period, or period of abatement, the thickness of the annual rings diminishes progressively, although in this latter period there is an intermediate phase in which the difference is hardly perceptible, a second phase in which the thickness decreases consistently, and a third phase in which the change again becomes slow. The age of the tree can not be correctly obtained by dividing the radius or diameter of the tree by an average annual growth measurement, but the growth rings must be actually counted. Where an attempt is made to estimate the age from the circumference, the measurement should be made at a distance of about 1.3 meters from the ground.

In the case of Taxus, it was noted that certain annual layers did not extend completely around the tree. With the same species it was found that as the trunk grew numerous small twigs were imprisoned. Where these twigs were alive they were surrounded by the wood, and where they were dead they were more closely united with the trunk.

Determination of the germination of seeds of forest trees, G. Schotte (*Skogsvårdsför. Tidskr., 5 (1907), No. 4–5, pp. 141–155*).—An account is given of experiments with the Rodewald-Cieslar germination apparatus and other methods of determining the germination of seeds of forest trees, with accounts of the work in this line done by other foresters. The best method for determining the germination of these seeds, in the author's opinion, is the one that will cause all viable normal seeds in the sample to germinate in the shortest possible time.—F. W. WOLL.

Annual progress report of forest administration in the western and eastern circles of the United Provinces for the forest year 1905–6, L. Mercer and H. Jackson (*Ann. Rpt. Forest Admin. West. and East. Circles [India], 1905–6, pp. 148*).—In this report the usual statements are given in regard to the constitution of State forests, the management, protection, sylviculture, exploitation, financial results, and administration for each of these regions, with tabulated annual statements in regard to the various phases of the work, including forest areas, surveys, receipts, disbursements, etc.

On fire stations in the Norrland forests, O. H. Humble (*Skogsvårdsför. Tidskr., 5 (1907), No. 4–5, pp. 158–171*).—The author recommends the establishment of a system of fire towers in forest districts for the ready discovery and extinction of forest fires. These may be located at points some 30 miles apart and connected with one another by means of a telephone system. The initial expenses are estimated for Jämtland County, Sweden, as follows: 2,000 kronor ($536) per tower, with 19 miles telephone connections, exclusive of poles, or 2,500 kronor ($670) with 33 miles telephone connections. The annual expenses connected with the maintenance of a system of 20 stations, including the pay of a watchman at each tower for 100 days would amount to 10,000 kronor ($2,680). This number of stations would serve to protect 2,873,513 hectares of forest at an expense of 35 oere (9.4 cts.) per 100 hectares per year.—F. W. WOLL.

The main features of the Norrland forest management, P. O. Welander (*Skogsvårdsför. Tidskr., 5 (1907), No. 3, pp. 139–149*).—F. W. WOLL.

Instructions for examinations. Agricultural settlement. (Act of June 11, 1906) (*U. S. Dept. Agr., Forest Serv. [Pamphlet], 1907, July 1, pp. 12*).—The act of June 11, 1906, provides for the entry of agricultural lands in forest reserves. This pamphlet gives directions as to the examination by officials of the Forest Service of lands so entered, and the keeping of records relating thereto.

Practical advice for making plantations in Algeria, E. Le Men (*Bul. Off. Gouvt. Gén. Algérie, 1907, Sup. 8, pp. 91–115*).—This pamphlet was prepared for the encouragement of various forms of tree plantings in Algeria, and includes popular directions for the selection of soil, and planting, cultivating, pruning, grafting of trees, including their use along avenues, highways, and irrigation canals, in the creation of wooded areas, and olive plantations.

On the loss in weight of drying logs and firewood, W. Ekman (*Skogsvårdsför. Tidskr., 5 (1907), No. 4–5, pp. 129–140*).—Determinations were made of the percentage decrease in weight of spruce, pine, and birch logs during the first 3 years after cutting both with the bark on and half or entirely barked. The losses ranged from 10 per cent (unbarked pine) to 45 per cent (barked spruce) for trees cut before June 1. The same percentage losses were obtained about July 1, whether the trees were cut early in the year or by June 1. Losses in the weight of fuel wood are also reported, as well as for whole trees with their branches on.—F. W. WOLL.

Production of lumber, lath, and shingles, by States and species, 1906, 1905, and 1904 (*Bur. of the Census [U. S.]; U. S. Dept. Agr., Forest Serv., 1907, July 19, folio*).—This folder, prepared jointly by the Bureau of the Census of the Department of Commerce and Labor and the Forest Service of the Department of Agriculture, contains tabulated returns from 21,077 mills in 1906, 11,666 mills in 1905, and 18,277 mills in 1904.

The use of carbolic acid emulsion in the impregnation of beech ties, R. LORENZ (*Centbl. Gesam. Forstw., 33 (1907), No. 4, pp. 137–141*).—The author has made experiments in the preservation of wood with different solutions, and is of the opinion that carbolic acid emulsion is not only less costly than tar oil but more effective. His experiments are described in detail. The cost of preserving a beech sleeper of 1 cubic meter with pure carbolic acid is said to be from about 12 to 16 cts., depending on the percentage of emulsion absorbed, and when introduced under a pressure of from 8 to 10 atmospheres the emulsion is said to occupy from 25 to 40 per cent of the volume of air-dried ties. When used with larger timber this emulsion is said to penetrate the wood equally as well as water or various soluble salt solutions.

Jamaica timbers, W. HARRIS (*Agr. News [Barbados], 6 (1907), No. 127, p. 71*).—In an article to the *Jamaica Daily Telegraph* the author suggests the use of local timber supplies in the rebuilding of Kingston, and gives a long list of native timbers suitable for house work, shingles, wharf piles, etc.

The staff-tree (Celastrus scandens) as a former food supply of starving Indians, F. T. DILLINGHAM (*Amer. Nat., 41 (1907), No. 486, pp. 391–393*).—Reference is made to the use of the staff-tree by some tribes of North American Indians in times of starvation. As a result of recent tests of both the bark and wood, conducted at the Bussey Institution of Harvard University, it appears that unlike the bark of most deciduous trees that of the staff-tree contains an abundance of a carbohydrate, known as mannan, to the presence of which is attributed a part at least of its physiological value.

The longleaf pine in virgin forest, G. F. SCHWARZ (*New York and London, 1907, pp. 135, figs. 23, dgms. 2, map 1*).—This book is intended as a contribution to the life history of the longleaf pine (*Pinus palustris*), with the view of presenting some of the most important silvical facts regarding this tree. The work is designed primarily for foresters, forest students, and owners and managers of southern pine timber lands.

The important phases under consideration are the character of virgin longleaf pine forests, natural rotation or evolution in the forest, tolerance, fires, the soil cover, injury to seedlings caused by hogs, rate of growth in virgin forest, and forest management. The work concludes with a chapter on the æsthetics of forestry. The text is illustrated with numerous figures and a map showing the general distribution of the longleaf pine.

Northern limit for spruce, A. W. GRANIT (*Skogsvårdsför, Tidskr., 5 (1907), No. 4–5, pp. 217, 218, fig. 1*).—A photographic reproduction and note on a spruce tree, which the author found growing in the Pasvig Valley near Klister Lake, South Varanger, in Russian Lappmark, at 69° 32′ 38″, and believes to be the northernmost spruce in the world. The tree was about 45 ft. high and 10 to 12 in. in diameter, 5 ft. from the ground.—F. W. WOLL.

Investigations on the production of caoutchouc from Manihot glaziovii, A. ZIMMERMAN (*Pflanzer, 3 (1907), No. 4, pp. 49–61*).—Tabular results are given of the author's rubber-tapping experiments with *Manihot glaziovii* in German East Africa, in which various systems of tapping were used, including the "Querring" method, perpendicular stripping, single incisions over large area, and the spiral and V-shape cut methods. The 3 former methods are the most successful thus far. At the end of 1 year's tapping from 9 trees less than

4 years of age, an average of 218 gm. of dry caoutchouc was produced per tree, the stems and larger branches both being tapped. One of these trees yielded 481 gm. and another 440 gm.

With regrad to the spiral method of tapping, the average yield of caoutchouc per single tapping was very small, ranging from 1.2 to 1.52 gm. of dry caoutchouc. The author is of the opinion that it will not compare favorably, even on older trees, with the 3 former methods. The V-shape method is considered worthy of further trial.

The greatest average yield per single tapping was secured with the single incision method over large surface, in which the average yield per tapping was 4.33 gm. of dry caoutchouc.

On some rubber plants in South Madagascar, J. Costantin and H. Poisson (*Compt. Rend. Acad. Sci.* [*Paris*], *144* (*1907*), *No. 19, pp. 1053-1055*).—In a recent tour through South Madagascar, M. Geay collected several species of caoutchouc, which are exploited to considerable extent by the natives. From 2 of these, locally known as Kokomba and Kidroa, the rubber is said to be extracted from the roots, which are gathered and exposed to the sun in order to create a rapid coagulation of the latex, after which they are beaten with a piece of hard wood. The separated bark is then pounded to a pulp and the mass boiled with water, in order to eliminate the greater portion of the free bark. The drying and boiling is repeated once or twice, after which the rubber is made up into regular commercial balls.

The authors describe these plants as new species of Mascarenhasia, *M. geayi* and *M. kidroa*, respectively. Two species of Landolphia, discovered at the same time, have been named *L. mamolava* and *L. mamavo*, and are also described.

Rubber from a tuber at last (*India Rubber World, 36* (*1907*), *No. 4, p. 300, fig. 1*).—A brief account is given of a tuberous rubber plant found in Portuguese West Africa, and reported by C. E. de Mello Geraldes, of the agronomical institute at Lisbon. This plant is locally known as "ekanda" and "marianga" and has been ascribed by J. Henriques to the natural order Asclepiadaceæ. It is said to flourish particularly in the sandy, treeless plateaus between the Kwanza and Zambesi rivers, and is described in part as a stemless biennial plant with a fleshy yellow tuberous root, sometimes turnip-shaped, but usually resembling a flattened sphere, the entire substance of which is permeated with lactiferous ducts.

Rubber has been obtained from the "ekanda" tubers by various crude experimental processes, chiefly by slicing them and applying pressure. Tubers 2 years old are referred to as attaining a diameter of 5½ in. and a weight of 1⅛ lbs. A rubber yield of ½ per cent of the total weight resulted from the crude processes.

DISEASES OF PLANTS.

The injurious effect of high germination temperatures upon the subsequent development of cereals, O. Appel and G. Gassner (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 5-7, fig. 1*).—During the spring and summer of 1906 the authors noticed in the summer grainfields about Dahlem a peculiar diseased condition, which examination of material showed was not due either to fungi or insects. The plants had lost their usual green color and the lower leaves were dead. It was suggested that the high temperature following the seeding might have been the cause of the injury, and pot experiments were undertaken with wheat, barley, and oats, one series of which was kept at 20 to 25° C. and the other from 5 to 7° during the period of germination.

After 3 weeks' subjection to the above temperatures the plants at the higher temperature showed the characteristic appearance noted above. Soil and fertilizer studies showed that these agents did not produce the trouble described and that the injury must have been caused by the high temperature at and following the period of germination.

As a practical means for preventing injury due to this cause the authors recommend the late seeding of winter grains and the early seeding of spring cereals.

The alteration of forage by parasitic plants, A. PORCHEREL (*Jour. Méd. Vét. et Zootech., 58 (1907), March, pp. 154–166, figs. 6; June, pp. 346–359*).—A résumé is given of literature relating to the changes induced by rusts, smuts, ergots, molds, etc., on various forage plants, and the effect produced on animals by feeding the infected forage.

Some investigations on the loose smut of cereals, O. APPEL and G. GASSNER (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 9–12, fig 1*).—The relation between the germination of cereals and the infection by smut is discussed. The authors claim that the more rapidly the cereal germinates the less subject it is to attacks of smut through seedling infection. The partial resistance of certain varieties of cereals to smut is due, in the authors' opinion, to the fact that the seed germinates and develops the seedling stage more quickly than others that are quite susceptible to disease.

A smut of tall oat grass, O. APPEL and G. GASSNER (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 12, 13*).—The authors describe *Ustilago dura* n. sp. as occurring on tall oat grass. The fungus resembles *U. perennans*, but differs from that species in important characters.

Changes in the head of square head wheat due to smut, O. APPEL (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, p. 12, fig. 1*).—On account of the reported effect of smut on square head wheat the author conducted some experiments in which alternate plats were seeded with infected and clean seed. The resulting crop showed profound changes in the character of the wheat heads, the normal square head being changed into an elongated, narrow, loosely spiked head. Where there was no infection the normal type of heads prevailed. The change is attributed to the smut, and it is said that frost or other injury will produce similar modifications.

Treatment of wheat for loose and stinking smuts (*Oklahoma Sta. Rpt. 1907, pp. 16–19*).—Directions are given for the treatment of wheat for the prevention of loose and stinking smuts, the information being drawn largely from Farmers' Bulletins of this Department (E. S. R., 10, p. 154; 17, p. 1078).

Notes on Fusarium, O. APPEL (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 31–33, fig. 1*).—The author describes the injury to various species of Leguminosæ by attacks of Fusarium, also a disease of cereals, known as the foot disease, which is attributed to a species of Fusarium, and the action of these fungi in destroying cellulose.

Notes on clover canker, R. ADERHOLD (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 21–24, figs. 2*).—The clover fields of parts of Germany are said to be frequently attacked by a disease which is variously referred to as canker or winterkilling, etc., but an examination of the plants showed that it was due mainly to *Sclerotinia trifoliorum*. The effect of the fungus on the host plant is described and notes given on the life history of the parasite. Experiments have been inaugurated to test the susceptibilty of various varieties of red, alsike, white, and crimson clover, and alfalfa to this fungus.

Clover sickness (*Jour. Bd. Agr. [London], 14 (1907), No. 4, pp. 223–227, figs. 2*).—Clover sickness is said to be due largely to attacks of nematodes (*Tylenchus devastatrix*) or the fungus *Sclerotinia trifoliorum*. Evidence is offered to show that the nematodes are a primary cause of clover sickness, and that in addition to attacking the clover, potatoes, strawberries, onions, and oats are subject to infestation.

Where crops show signs of disease, applications of sulphate of potash are recommended, and where practicable the sterilization of the soil by the use of gas lime is advised. The removal and burning of infested material will greatly aid in preventing the spread of the disease.

Cotton anthracnose and cotton rust, A. C. LEWIS (*Ga. Bd. Ent. Bul. 24, pp. 49–71, figs. 8*).—A description is given of the anthracnose of cotton caused by *Colletotrichum gossypii*, and the relation of certain insects to the disease is discussed. It is believed by many that a number of insects, such as the green soldier bug, the cotton leaf bug, and others, by puncturing the bolls cause the disease, but in the author's opinion there is no relation between the insect puncture and the anthracnose, aside from the possibility of spreading the disease by insects visiting from boll to boll.

Among remedies suggested for the prevention of anthracnose the author discusses resistant plants, resistant varieties, the rotation of crops, and treatment of seed before planting.

The red rust, black rust, angular leaf spot, etc., are briefly discussed.

The root rot of sugar beets, W. BUSSE, L. PETERS, and F. C. VON FABER (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 15–18*).—As a result of experiments the authors recognize three causes of root rot of sugar beets, namely, *Pythium debaryanum*, *Phoma betæ*, and *Aphanomyces lævis*, and they think it very improbable that *Myxomonas betæ* is the cause.

Experiments were conducted to prevent root rot by treating the seed with solutions of calcium carbonate and Bordeaux mixture and by soil treatment with slaked and quick lime The results obtained with the carbonate of lime do not warrant its further trial. Bordeaux mixture gave favorable results, and the experiments in soil treatment are to be continued.

A pustule scab of beets, W. BUSSE and F. C. VON FABER (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 18–20, fig. 1*).—A brief description is given of a form of scab occurring on sugar beets in northern and central Germany, the cause of which is said to be *Bacterium scabiegenum* n. sp. A previous report of this disease has been noted (E. S. R., 18, p. 948).

Black rot of cabbages and turnips (*Jour. Bd. Agr. [London], 14 (1907), No. 4, pp. 228, 229, fig. 1*).—An account is given of the black rot of cabbages and turnips due to *Pseudomonas campestris*, and it is stated that in England rape appears to be most susceptible to the disease.

In an extensive trial plat with various kinds of cabbage, Brussels sprouts, etc., those strains which are related to rape were first attacked, while those without this relationship were the last to succumb.

Attention is called to the investigations carried on at the New York State Station (E. S. R., 16, p. 480), which showed that the disease might be carried through infected seeds, and as a precautionary measure it is recommended that all cabbage seeds be disinfected by soaking them for 15 minutes in a solution consisting of 1 part of corrosive sublimate to 1,000 parts of water, or 1 lb. of formalin to 30 gal. of water.

Crown gall (*Oklahoma Sta. Rpt. 1907, pp. 24–26*).—A popular account of the crown gall, which attacks apples, pears, peaches, apricots, and other fruit trees. A warning is given against the planting of infested stock.

Cedar apples (Gymnosporangium macropus), F. D. HEALD (*Science, n. ser., 26 (1907), No. 659, pp. 219, 220*).—During the past few years cedar rust has increased in abundance and severity in Nebraska and adjacent States, threatening the life of cedars in many places where they are used as wind-breaks about orchards. In many localities the cedars are considered very valuable and assistance has been asked to save them from the destructive effect of this fungus. As a result observations have been made on the life history of the rust, and spraying experiments are in progress.

In 1906 it appears that the first cluster-cups on the apple matured about the first of July, but at this date only a few were open and these were mostly on fruit where two or more apples were in contact. A few days later young cedar apples as large as radish seeds were abundant on the cedars. Observations made at other points showed the almost simultaneous occurrence of the fungus on the apple and the cedar. Small cedar trees were inclosed in glass houses so ventilated as to prevent infection from the outside, but cedar apples developed upon them early in July.

Concerning these observations the author offers two explanations, either that the fungus is perennial or the æcidial spores of one season produce the cedar apples which appear in June of the next year and reach their maturity in the autumn. There appears to be some evidence of the perennial character of the mycelium, but the second explanation is at present believed more probable. If this is true, the cedar is probably infected in summer and autumn, but no evidence of the resulting cedar apples can be noted until the next season's growth. It would then require two years for a cedar apple to develop. Further observations are being carried on to substantiate this view.

The relationship of Phyllosticta solitaria to the fruit blotch of apples, J. L. SHELDON (*Science, n. ser., 26 (1907), No. 658, pp. 183-185*).—The fruit blotch of apples has been previously referred to an undetermined species of Phyllosticta (E. S. R., 13, p. 1059; 18, p. 1062), and the author reports having observed the fungus on the wild crab apple as well as on cultivated apples. A study of the material showed that the parasite in both cases was the same, and it was determined that the blotch disease of apples is caused by *P. solitaria*, a fungus occurring either on the leaves, fruits, or branches of the wild crab and cultivated apple.

Control of bitter rot of apples, J. C. BLAIR (*Illinois Sta. Circ. 112, pp. 13*).—This circular consists of a summary of results of the work carried on at the station, the details of which are to be published in a forthcoming bulletin. The principal results obtained indicate that the disease can be successfully controlled by the application of standard Bordeaux mixture, the sprayings to be made so that the fruit will be well covered with the fungicide. Spraying the dormant trees with copper sulphate solutions or other strong washes is said to be ineffective in controlling the bitter rot. The application of salt on the ground about trees was found to be without any value.

Experiments with black spot of apple, D. MCALPINE (*Jour. Dept. Agr. Victoria, 5 (1907), No. 6, pp. 362, 363*).—On account of the claims made that a number of proprietary sheep dips have important fungicidal value, the author carried on in 1905-6 and 1906-7 a series of spraying experiments to compare their efficiency with Bordeaux mixture and soda Bordeaux mixture in controlling black spot of apples. From the experiments it is conclusively shown that sheep dips, phenyl, and similar preparations are not to be compared with Bordeaux mixture or copper soda mixture as a treatment for black spot.

Some new parasites of cacao, L. LUTZ (*Bul. Soc. Bot. France, 53 (1906), pp. XLVIII-LII, figs. 2*).—Descriptions are given of 3 parasites that have been recently recognized as occurring on the pods and seeds of cacao. The species described are *Macrosporium verrucosum* n. sp., *Sterigmatocystis luteo-nigra* n. sp., and *Fusarium theobromæ* n. sp.

Concerning thrombosis of currants and gooseberries, R. ADERHOLD (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 26, 27*).—A brief description is given of a disease of currants and gooseberries in which the water conductive tissues are plugged by growths of the mycelium of a species of Verticillium.

The American gooseberry mildew attacking red currants, E. S. Salmon (*Gard. Chron., 3. ser., 42 (1907), No. 1072, p. 26*).—While investigating an outbreak of American gooseberry mildew (*Sphærotheca mors-uvæ*), the author found that the fungus had spread to red currant bushes which were growing intermixed with gooseberry bushes. This fact seems to show that the fungus is capable of directly attacking and living on the red currant and does not require time to accustom itself to this host.

In addition the author mentions having observed the European gooseberry mildew (*Microsphæra grossulariæ*) occurring on red currant bushes. In this case the mildew was not confined to the leaves, as is usually the case, but occurred also upon the berries.

Notes on some diseases of the grape, L. Ravaz (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 7, pp. 837, 838*).—The author reports failure to discover the mycelium of *Uncinula americana* on the young shoots or on the bud scales of the grape, where it is claimed the fungus passes the winter. He has found it quite regularly within the dormant buds about the axis and among the developing grapes within the buds. If the fungus normally winters in this way, the failure to prevent the appearance of powdery mildew by the use of strong washes on the dormant vine is explained.

Court-noué, a destructive disease in central France, Italy, and Spain, the cause of which has been attributed to various species of bacteria, fungi, etc., is due, according to the author, to the action of late frosts upon the young shoots.

Another disease of grapes, to which the name apoplexy is given, is caused by *Polyporus igniarius* and not by accidental and meteorological conditions.

The injury of grape leaves through the application of fungicides, F. Muth (*Mitt. Deut. Weinbau Ver., 1 (1906), No. 1, pp. 9–18; abs. in Bot. Centbl., 105 (1907), No. 28, pp. 26, 27*).—Attention is called to the injury of grape leaves due to the use of heavy applications of Bordeaux mixture for the prevention of attacks of downy mildew. Often the young leaves are entirely destroyed and the older ones covered with small brown spots. The Reissling grapes appear especially subject to Bordeaux mixture injury, while the American varieties seem more resistant to weather conditions and to the injurious effect of the fungicide than most European varieties. For the tender sorts spraying with 1 per cent Bordeaux mixture is recommended.

The leaves and fruits of the apple are said to be subject to similar injury.

Cocoanut bud rot, W. T. Horne (*Bol. Ofic. Sec. Agr. Cuba, 3 (1907), No. 1, pp 1–5*).—An account is given of investigations by the author on the bud rot of cocoanut trees in different parts of Cuba. This disease has become quite destructive in certain groves, but it is believed that destroying the affected trees by burning, if promptly done, will hold it in check. The author outlines a series of investigations on this disease which he plans to take up.

Leaf blight of the plane tree, W. A. Murrill (*Jour. N. Y. Bot. Gard., 8 (1907), No. 91, pp. 157–161, figs. 2*).—An account is given of a serious fungus disease which during the past season has caused the leaves and young twigs of the plane or sycamore tree to change color and die as though scorched by fire. This disease was quite conspicuous throughout the eastern part of the United States during the past season, and is attributed to the fungus *Glœosporium nervisequum*. The mycelium of the fungus lives within the leaves and twigs, the fruiting portions appearing in brown patches on the twigs or leaves that have been killed. Both the American and Old World species of sycamore are subject to attack, but the effects of the fungus are ordinarily not lasting, except in the case of trees already weakened by disease or starvation.

No treatment for the disease is suggested, as on account of the large size of the trees and the fact that the fungus is an internal parasite in the leaves and twigs, spraying would not be possible.

A blight disease of young conifers, P. Spaulding (*Science, n. ser., 26 (1907), No. 659, pp. 220, 221*).—During the past spring a serious outbreak of blight was noticed in a large conifer nursery in Nebraska on the needles of 2-year-old seedlings of *Pinus ponderosa* and *P. divaricata*. The damage was very considerable, several hundred thousand trees being affected.

The disease is characterized by a gradual dying back of the needles from the tip to the base. From specimens of diseased trees placed in moist chambers spores were obtained of a species of Pestalozzia. Cultures were made from these and successful inoculations made on healthy seedlings. The various species of Pestalozzia have been known as parasites of conifers in Europe, but while the fungus has been found in this country, its presence as an active parasite seems to have been overlooked.

For preventing the spread of this disease throughout the nursery the author recommends the removal and burning of diseased trees, accompanied by thorough spraying of the remainder with Bordeaux mixture containing some adhesive substance.

Some smut diseases of garden plants, G. Korff (*Prakt. Bl. Pflanzenbau u. Schutz, 5 (1907), No. 7, pp. 79–82, fig. 1*).—Descriptions are given of the smut of violets, due to *Urocystis violæ*, and onion smut (*U. cepulæ*), and the occurrence noted of *U. gladioli* on gladiolus, *U. anemones* on species of aconite and anemone, *U. filipendulæ* on spiræa, and *Ustilago scorzoneræ* on black salsify, *U. violacea* on pinks, and *U. tulipæ* on tulips.

The leaf-tip blight of Dracæna fragrans, J. L. Sheldon (*Jour. Mycol., 13 (1907), No. 90, pp. 138–140*).—The author reports studies on the diseased leaves of greenhouse specimens of *Dracæna fragrans*, in which the lower leaves were entirely dead and the middle ones dead at their tips. Small black specks were scattered throughout the dead portions of the leaves, and a microscopical examination showed that they had probably been killed by a species of Glœosporium.

The author found that a similar trouble had been described in a report of the New Jersey Station (E. S. R., 6, p. 823) in which the fungus was attributed to Glœosporium. A study of the material mentioned above revealed some doubt as to the specific relationship of the parasite, but as it corresponds more nearly to the genus Physalospora than any other, it is placed in that genus for the present, and the name *Physalospora dracæna* n. sp. proposed for it.

A bacterial disease of cultivated stock, F. C. von Faber (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 24, 25*).—The author notes the occurrence of *Pseudomonas campestris* upon cultivated stock.

Protection against plant diseases and insects (*Oklahoma Sta. Rpt. 1907, pp. 26–31*).—Formulas are given for the preparation of Bordeaux mixture, Paris green, and Bordeaux mixture to which Paris green is added, together with directions for their application.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Selection and crossbreeding in relation to the inheritance of coat pigments and coat patterns in rats and guinea pigs, H. MacCurdy and W. E. Castle (*Carnegie Inst., Washington Pub. 70, pp. 50, pls. 2, figs. 5*).—The experiments reported in this paper were undertaken to obtain evidence of value in determining whether evolution and the formation of species are accomplished by the natural selection of minute variations or by mutation. The experimental animals were rats and guinea pigs and were crossed according to various plans so as to make easy the determination of the laws which prevailed in the inheritance of color patterns in their coats.

It was found that the inheritance of color patterns took place, in most cases, according to Mendelian requirements, but that inheritance is both alternative and blending. Since it is impossible to distinguish between continuous and discontinuous variations, and between blending and alternative inheritance, it seems unwise to attribute evolutionary processes to one sort of evolution only.

The cause of partial and total albinism, J. H. W. T. Reimers (*Cultura, 19 (1907), No. 224, pp. 267–274*).—The literature relating to this subject is discussed in connection with bibliographical notes. The author reaches the conclusion that albinism in domestic animals is a recessive character in the Mendelian sense.

Experiments in the destruction of rats on board ship by means of liquid sulphurous anhydrid, A. Chantemesse (*Rec. Hyg. Pub., 35 (1905), pp. 191–214*).—It often becomes necessary to destroy rats on board loaded freight vessels and in other situations where fabrics and provisions are stored. In such cases the reagent used in killing rats must be of such a nature that it does not cause serious injury to the stored materials. A long series of experiments was carried on with a patented apparatus which uses sulphur dioxid condensed in water in the form of sulphurous acid. The apparatus is claimed to add ozone to the gas during the process of its evolution. For this reason, the resulting gas mixture contains both sulphur dioxid and sulphur trioxid. The gas was employed in the destruction of rats on board vessels loaded with silk, woolen, and cotton goods, skins, rubber, metals, legumes, fruits, preserves, etc. The injury caused to these materials by the fumigation was not serious. The committee which was entrusted with the supervision of the experiments reports that rats are effectively destroyed by means of this apparatus and recommends its use for the purposes specified above.

Destruction of rats, R. Wurtz (*Rec. Hyg. Pub., 35 (1905), pp. 473–483*).—In the series of experiments reported by this author upon the use of a proprietary apparatus for producing sulphur dioxid and sulphur trioxid, it was found that sulphur dioxid alone is as effective as when mixed with sulphur trioxid. Claims for special efficiency from the addition of sulphur trioxid are therefore discredited. No objection, however, is raised to the use of the machine which seems to destroy rats effectively.

Combating rats and mice, Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, 5 (1907), No. 6, pp. 61–63*).—Brief mention is made of the results commonly obtained in fighting mice and rats with infectious diseases and proprietary forms of virus prepared in different laboratories. The author believes that better results will be obtained from the use of a bait poisoned by barium carbonate.

Hawks and owls from the standpoint of the farmer, A. K. Fisher (*U. S. Dept. Agr., Biol. Survey Circ. 61, pp. 18, figs. 6*).—This circular is a revised form of an article published in the Yearbook for 1894 (E. S. R., 7, p. 470).

Directory of officials and organizations concerned with the protection of birds and game, 1907, T. S. Palmer (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 62, pp. 16*).—This directory contains in a convenient form the names of persons to whom application may be made for information regarding game laws.

List of publications of the Biological Survey, Department of Agriculture, 1907 (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 60, pp. 7*).

Twenty-second report of the State entomologist on injurious and other insects of the State of New York, 1906, E. P. Felt (*N. Y. State Mus. Bul. 110, pp. 39–186, pls. 3, figs. 2*).—During the year under report particular attention was devoted to the insect pests of fruit and shade trees, the gipsy moth, brown-tail moth, gall midges, aquatic insects, and nursery inspection. The occurrence of *Thysania zenobia* is reported in Albany. This insect was apparently imported from South America.

Detailed notes are given on a large number of injurious insects upon which observations were made. These include scurfy scale, San José scale, asparagus beetle, tree crickets, grapevine root-worm, sugar-maple borer, *Contarina violicola*, etc. The last-named insect appears to threaten serious damage to the industry of violet growing. The injuries caused by this pest may be somewhat reduced by maintaining low temperatures in the violet houses during early fall and by careful examination of violets before they are planted. Warnings are issued regarding the possible introduction into New York of gipsy moth, brown-tail moth, and oriental slug caterpillar.

A summary is given of the notes received from voluntary entomological observers throughout the State. The author presents a list of the entomological articles issued by his office during the year and also a list of the insects received for identification and for specimens.

In an appendix to the bulletin descriptions are presented of a large number of new species of Cecidomyiidæ.

Second annual report of the State entomologist, E. F. Hitchings (*Ann. Rpt. State Ent. Maine, 2 (1906), pp. 77, pls. 2, figs. 21*).—A general report on the miscellaneous work of the State entomologist for the year 1906. Particular attention was given to a study of the distribution and means of combating gipsy moth and brown-tail moth in Maine. The San José scale has not yet been discovered in Maine, but it is feared that infestation may take place.

Brief practical notes are also given on apple-tree tent-caterpillar, strawberry weevil, oyster-shell bark-louse, woolly aphis, and various other injurious insects. Mention is made of the interest taken by various local organizations in the work of eradicating insect pests.

Entomological practice, J. Vosseler (*Pflanzer, 3 (1907), No. 5-6, pp. 65-77*).—Attention is called to the important functions of the economic entomologist, particularly in countries where this subject has not been widely promulgated. The present account is largely a description of the work of the zoological laboratory of the biological agricultural institute at Amani. Mention is made of the many difficulties encountered by the economic entomologist in his work.

Notes on insect, fungus, and other pests (*Jour. Bd. Agr.* [*London*], *14 (1907), No. 4, pp. 212-222*).—Biological and economic notes are given on *Smerinthus ocellatus*, *Neoclytus caprea*, *Phaedon betulæ*, carabid beetles, mites, eelworms, larvæ of leaf-mining flies, plant lice, etc.

New genera and species of Aphelininæ, with a revised table of genera, L. O. Howard (*U. S. Dept. Agr., Bur. Ent. Bul. 12, pt. 4, tech. ser., pp., 67-88, figs. 10*).—In the present paper descriptions are given of 20 new species and 5 new genera of Aphelininæ. They are supplementary to those published in a previous bulletin (E. S. R., 7, p. 516). The Aphelininæ have proved to be of great importance in the control of scale insects.

Leaf hoppers—Supplement, G. W. Kirkaldy (*Hawaiian Sugar Planters' Sta., Div. Ent. Bul. 3, pp. 189, pls. 20, figs. 3*).—From the leaf hoppers collected by Koebele, Perkins, and Muir in Australasian countries, Fiji Isles, and China, 58 additional genera and subgenera and 175 species and varieties are described as new. This makes a total of 143 genera and 387 species from the material just mentioned. The author presents technical descriptions of species, analytical tables for their identification, and biological notes.

The anatomy of the proboscis of Stomoxys, J. W. W. Stephens and R. Newstead (*Ann. Trop. Med. and Par., 1 (1907), No. 2, pp. 171-198, pls. 8*).—The methods adopted in making dissection of specimens of Stomoxys are described in some detail. The anatomical features of the various parts of the proboscis and connected structures in this genus are enumerated.

A disease of oats due to Tarsonemus spirifex, L. Guille (*Jour. Agr. Prat., n. ser., 13 (1907), No. 18, pp. 552–556, figs. 4*).—Oats attacked by *Tarsonemus spirifex* show peculiar cigar-shaped enlargements at the apex of the stems. The head of infested oats becomes spirally coiled, but remains shorter than in normal plants, so that it is entirely contained within the sheaf. The author believes that the farmer has neglected cultural methods with oats under the belief that they are not so valuable as other cereal grains and that this neglect favors infestation by the parasitic mite. Liberal use of fertilizers is recommended as a preventive remedy.

Grain weevils, J. R. Inda (*Com. Par. Agr.* [*Mexico*], *Circ. 59, pp. 21, figs. 8*).—Biological and economic notes are given on the grain weevil, various species of pea weevils, and other insects injurious to stored grain. The usual methods of controlling these pests are recommended, including fumigation with bisulphid of carbon.

The pepper weevil, J. R. Inda (*Com. Par. Agr.* [*Mexico*], *Circ. 58, pp. 11, pls. 3, fig. 1*).—Attention is directed to the attacks of *Anthonomus eugenii* upon Chili peppers. It is commonly held that direct application of insecticides is of little use in controlling this pest, but if applied in time Paris green may give fairly satisfactory results. The author recommends that all fallen fruits be collected and destroyed promptly and that rapid growing varieties of peppers be selected.

Fighting the boll weevil by picking up the infested squares, W. Newell (*Crop Pest Com. La. Circ. 15, pp. 4*).—In average seasons when it is possible to produce an early crop of cotton the author would not recommend the additional expense necessary in picking up and destroying infested squares. It appeared impossible, however, to secure an early crop during the present season, and the author, therefore, suggested as a means of preventing the undue ravages of the boll weevil that fallen squares be collected once a week until July 25, and that these squares be destroyed or confined in wire-cloth cages, so as to allow merely the parasitic insects to escape.

The most important factor in solving the boll-weevil problem, A. Mayer (*Crop Pest Com. La. Circ. 16, pp. 8*).—The author maintains that cotton is the most important money making crop of the South. He considers that in the production of large crops in the future, animal industry in the South will contribute largely by increasing the fertility of the soil. Animal industry can be encouraged most in the South by the eradication of the cattle tick, which is, therefore, considered the most important factor in solving the troubles of the cotton planter.

Insect pests of jute, H. M. Lefroy (*Agr. Jour. India, 2 (1907), No. 2, pp. 109–115, pl. 1, fig. 1*).—A considerable number of insect pests have been observed feeding upon jute, but fortunately not all of them are thus far of a serious nature. Particular attention is given to an account of *Caradrina exigua* and *Cosmophila sabulifera*. A number of less important pests are also noted. Specific remedies have not been devised for these pests of jute, but thorough and clean cultivation is suggested as an important preventive treatment.

Some insects injurious to truck crops. The cranberry spanworm. The striped garden caterpillar, F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Bul. 66, pt. 3, pp. 21–32, figs. 2*).—*Cleora pampinaria* has been known for some time as an enemy of the cranberry. The insect is described in its various stages. It is distributed from Maine to the Gulf region. It attacks garden and farm crops, orchards, and forest trees. The larvæ feed on the foliage of host plants. The egg and larval stages have not been determined. The natural enemies of the pest are not of much importance, but it may be controlled on asparagus by spraying with arsenicals.

Mamestra legitima feeds on garden plants, particularly asparagus, cruciferous and leguminous plants. Descriptive and economic notes are given on this insect. There are 2 generations annually, and hibernation occurs in the pupal stage. The larvæ may be destroyed by mechanical means or by spraying with arsenicals alone or in Bordeaux mixture.

Fruit flies, C. FRENCH (*Jour. Dept. Agr. Victoria, 5* (*1907*), *No. 5, pp. 301–312, pl.* 1.)—Particular attention is given to an account of the Mediterranean fruit fly, the life history of which has been carefully studied by the author. This insect spends 12 days in the egg stage, 13 days in the pupal stage and 24 days as an adult. Descriptive and economic notes are also given on other species of fruit flies, including *Dacus tryoni*, *Tephritis psidii*, etc.

The author believes that fruit flies have not yet become permanently established in Victoria. It is recommended that kerosene boxes, such as have been used in western Australia, be placed in infested orchards. Careful inspection of imported fruit is also necessary.

The woolly aphis on apple trees, G. D'UTRA (*Rev. Agr.* [*São Paulo*], *12* (*1907*), *No. 143, pp. 243–249*).—Notes are given on the life history of this insect and on the injuries which it causes to apple trees. The greater part of the article is occupied with a discussion of insecticides which may be used in destroying the pest. These include kerosene, crude naphthalin, creosote, alcohol, whale-oil soap, turpentine, etc. Good results were obtained from a mixture containing 1 kg. whale-oil soap and 2 liters of kerosene in 10 liters of water.

Threadworms in grapevines and pear trees, G. KORFF (*Prakt. Bl. Pflanzenbau u. Schutz, 5* (*1907*), *No. 6, pp. 67–69, fig. 1*).—Reports have been received by the author of the finding of threadworms in grapevines and pear trees. These worms proved to be species of Mermis, and attention is called to the fact that they are commonly parasites of insects.

The sphinx of grapevines, R. BRUNET (*Rev. Vit., 28* (*1907*), *No. 707, pp. 5–7, pl. 1*).—Mention is made of the habits, biology, and natural enemies of *Sphinx elpenor* which in some years causes serious damage to grapevines. In combating this pest the adult moths may be attracted to lights and captured in this way. The larvæ are readily destroyed by the application of insecticides. The one especially recommended by the author is a mixture of naphthalin and sulphur.

The destruction of the olive fly, M. DE CILLIS (*Coltivatore, 53* (*1907*), *No. 27, pp. 8–11*).—The mixture previously recommended for the destruction of this fly, while effective, is rather too expensive. The author therefore experimented with a similar poisonous bait and obtained good results from the use of one containing 50 parts molasses, 48 parts grape juice, and 2 parts of arsenicals.

The action of low temperatures on the eggs and caterpillars of Paralipsa gularis, J. DE LOVERDO (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 1, pp. 90–92*).—Almonds in storage, whether decorticated or not, are seriously attacked by the caterpillars of *P. gularis* and also by those of *Plodia interpunctella*. The means commonly used for controlling these insects, particularly the former species, include whitewash and the application of insecticides directly to the stored fruit. These methods have proved unsatisfactory and ineffective. The author, therefore, tested the value of low temperatures in checking the development of the caterpillars. It was found that eggs of *P. gularis* when maintained at temperatures ranging from —3 to +4° C. from April until October did not hatch. Caterpillars kept at about the freezing point for a number of months do not show any of the usual signs of life, although a large percentage of them recover after being removed from cold storage. It is suggested, therefore, that the insects in question may be largely controlled by the application of low temperatures.

White-marked tussock moth and elm-leaf beetle, E. P. FELT (*N. Y. State Mus. Bul. 109, pp. 31, pls. 8*).—These 2 pests are described and notes given on their habits, life history, and natural enemies. The tussock moth may best be combated by collecting the egg masses, banding tree trunks, and spraying with arsenical poisons. The elm-leaf beetle may be controlled by spraying with arsenicals in the spring and by applying contact insecticides to the full grown larvæ at the base of the trunk.

The anatomy and histology of ticks, S. R. CHRISTOPHERS (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1906, No. 23, pp. 55, pls. 6*).—A detailed account of the anatomy and histology of 2 types of ticks is given. These types are *Rhipicephalus annulatus* and *Ornithodoros savignyi.* The literature of the subject is discussed in connection with a brief bibliography. The author also considers the agency of ticks in transmitting disease, the structure of the eggs of ticks, and the essential points in their embryology.

Ticks as distributors of disease, W. DÖNITZ (*Pflanzer, 3 (1907), No. 7, pp. 97–108*).—Attention is given chiefly to a critical review of the results obtained in a study of cattle ticks of various species particularly in Africa, and also of *Argas persicus.*

Note on the occurrence of the North American fever tick on sheep, W. D. HUNTER (*U. S. Dept. Agr., Bur. Ent. Circ. 91, pp. 3*).—It is reported that J. D. Mitchell has observed fully engorged cattle ticks on sheep in 3 counties of Texas. It is suggested that in some localities a pasture might remain infested indefinitely with no host animals for the ticks except sheep. The wounds produced by the ticks on sheep sometimes become infested with the screw worm and require treatment. It has not been determined whether the offspring of cattle ticks which have developed on sheep can transmit Texas fever.

A simple plan of eradicating the cattle tick by the pasture rotation method, W. NEWELL (*Crop Pest Com. La. Circ. 14, pp. 4*).—The plan proposed in this circular is based on the facts that eggs deposited after the beginning of cool weather do not hatch until after the second spring, and that fields cultivated during the summer are free from ticks after the first of December. It is, therefore, recommended that the farmer provide a tick-free pasture for cattle after they have been freed from ticks during the coming winter, and that care be exercised to prevent the reinfestation of such pastures or of the cattle after they have once been freed from ticks.

The Leishman-Donovan body in the bedbug, W. S. PATTON (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1907, No. 27, pp. 19, pl. 1, chart 1*).—In cases of kala-azar the parasites observed in the white blood corpuscles have been suspected of being transmitted by lice, mosquitoes, fleas, and ticks as well as bedbugs. The parasitic bodies may be found in the intestines of *Cimex macrocephalus* allowed to suck the blood of patients affected with kala-azar. It is possible, therefore, that the disease may be transmitted by the Madras bedbug.

On the importance of larval characters in the classification of mosquitoes, S. R. CHRISTOPHERS (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1906, No. 25, pp. 18, pls. 3*).—A system of classification for mosquitoes is proposed upon the basis of larval characters. The author does not claim that the classification is a rigid one, but maintains that the different genera can be grouped together more satisfactorily according to the larval than the adult characters.

An automatic oiler for the destruction and prevention of mosquito larvæ in cesspools, E. H. and H. C. Ross (*Ann. Trop. Med. and Par., 1 (1907), No. 2, pp. 165–167*).—A description is given of a simple apparatus consisting of a crude oil can furnished with 2 openings plugged with cotton and sand so that the water enters the can slowly as the oil is forced outward at the upper opening. The oil passes out of the can at the rate of about 50 cc. daily for nearly 2 months. It is recommended that the automatic oiler be removed and replaced by a new one after 10 weeks. The apparatus costs about 12 cts.

The East African honeybee, J. Vosseler (*Ber. Land u. Forstw. Deutsch-Ostafrika, 3 (1907), No. 2, pp. 15–29*).—Throughout German East Africa there is a race of honeybees considerably smaller than German bees and distinguished by a brownish-red color of the first abdominal ring. Occasionally this brown ring is absent and the bees then resemble the German race of bees except for their small size.

The East African bees are industrious workers and gather honey almost continuously. The seasons for honey-bearing flowers are not as marked as in temperate climates, but while the conditions are favorable for plant growth during the whole year the best condition of honey-producing plants is observed during certain seasons which correspond in a way to our spring and summer.

Scales for weighing beehives, C. Jungfleisch (*Apiculteur, 51 (1907), No. 7, pp. 282–287, figs. 5*).—Recently considerable interest has been manifested in securing a practical type of scales for weighing colonies of bees. The author maintains that it is highly desirable to have such an apparatus, since otherwise it is almost impossible to determine the condition of the colony with regard to the amount of its stores. It is not considered necessary that the scales should be graduated so as to show actual pounds, but should merely indicate whether the colony is increasing or diminishing in weight.

The Caucasian sericultural station; its organization and work from 1887 to 1905 (*Kavkazskaya Shelkovodstvennaya Stantzya cya Ustroistvo i Dyeyatelnost, 1887–1905. Tiflis: Caucasian Sericultural Sta., 1906, vol. 1, pp. IV+537, pls. 36, figs. 113; 1907, vol. 2, pp. IV+517, pls. 5*).—In part 1 a general historical statement is given of the development of sericulture in those countries which are most noted for this industry and of the governmental and other assistance which has been offered for promoting sericulture. Particular attention is directed to a historical account of the organization and development of the Caucasian sericultural station, biographies of the men connected with this work, and the special lines to which they have devoted their energies.

In the second part the work accomplished by the station is discussed with reference to the original contributions made to the science of sericulture, and the practical methods devised and popularized by the officials connected with the station.

FOODS—HUMAN NUTRITION.

Report on bleaching of flour, H. Snyder (*[St. Anthony Park, Minn.]: Author, 1906, pp. 15*).—The deductions which the author drew from the investigations reported follow:

"When flour is bleached by the action of electricity no mineral nitrites are formed, but there is a feeble combination of nitrogen peroxid with water, to the extent of about 0.00003 of a part to 100 parts of flour.

"This gas residue is entirely expelled when the bread is baked in an oven from which all gases of combustion are excluded. Bread made from bleached flour and properly baked contains no trace of the bleaching gas.

"Bread made from unbleached flour and baked in a gas oven in which the oven is connected with the combustion chamber, may contain twice as much nitrites as are present in bleached flour. The nitrites present are derived from the combustion of the gas used as fuel and not from the flour.

"All chemical authorities agree that nitrogen peroxid products alone, or in feeble combination with water, are readily volatilized when warmed.

"Nitrites are present in traces in many food products, particularly in those of vegetable origin. Nitrites are a normal constituent of the saliva and were found present to the extent of from 10 to 20 times the amount found in the heaviest bleached flours. In the case of the bleached flours, however, all of the gas residue is expelled during the process of bread making.

"Flours that have not been bleached, but stored for periods of 1 to 3 months, may show traces of nitrites due to absorption from the air, which contains nitrites in traces as a normal constituent."

Effect of bleaching on the quality of flour, GRENIER (*Bul. Soc. Agr. France, n. ser., 39 (1907), May 15, Sup., pp. 511–518*).—From studies of bleached and unbleached flour stored in different ways, the author concludes that bleaching diminishes the fat content and increases the acidity and that the character of the gluten is also changed. No difference was noted in the keeping qualities of bleached and unbleached flour when stored in jars or sacks and he concludes that there is no reason for bleaching.

On the food plants cultivated by the Umbundu-speaking natives of Portuguese West Africa, F. C. WELLMAN (*Jour. Trop. Med.* [*London*], *10 (1907), No. 9, pp. 157–160*).—Brief descriptions are given of the different sorts of Cruciferæ, Leguminosæ, Cucurbitaceæ, Gramineæ, and a number of other food plants cultivated by the Portuguese West African natives. Indian corn is the most important food crop of the region. The green stalks are chewed like sugar cane for the sweetish sap which they contain, while the green and ripe ears are favorite articles of food. The dry corn is used for making hominy and for meal and is also parched. Rice, Kafir corn, *Pennisetum typhoideum* and *Eleusine coracana* are also cultivated as food grains. The author has summarized in tabular form data regarding the composition of a number of the native foods which he has described.

"In conclusion, it must be pointed out that while the cultivated food plants above mentioned compose by far the greater part of the Umbundus' dietary, yet the people are not vegetarians by choice. Meat of all sorts of game, besides beef, pork, mutton, goat's flesh, fowls, and fish enter into their list of foods whenever obtainable. Rats and mice, locusts, and other insects and their larvæ are also eaten. Many wild fruits, etc., are also eagerly sought."

Concerning fruit juice statistics for the year 1906, F. SCHWARZ and O. WEBER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 6, pp. 345–349*).—Analyses are reported of a number of samples of raspberry juice and sirup prepared by the authors. The work was undertaken with special reference to the examination of such goods with a view to the detection of sophistication.

Canning and preserving, G. MCCARTHY (*N. C. Dept. Agr., Biol. Div., 1907, pp. 37*).—The value of canned fruits and vegetables is briefly discussed and directions are given for the home canning of fruits and vegetables, for making wine, vinegar, etc., and for pickling and preserving meats and fish. The author has also included estimates of the cost of the equipment of a small commercial canning plant.

The constants of whisky, J. H. SHEPARD (*Rpt. Chem. So. Dak. Food and Dairy Com., 1906, pp. 20*).—The analyses reported and discussed were made for the purpose of securing data for the examination of whisky under the pure-food law.

Report on the examination of canned meats (*Mo. Bul. N. Y. State Dept. Health, 23 (1907), No. 4, pp. 2–9*).—Data are reported regarding the examination of 154 samples of canned and potted meats and similar goods collected prior to January 1, 1907. Thirty of the cans examined had only fair meat contents, 25 had low-grade meat contents, and 7 had very poor meat contents, while 1 sample of potted ham was made from diseased meat, the embryos of *Trichina spiralis* being identified.

Changes which take place in eggs, A. Chrétien (*Hyg. Viande et Lait, 1 (1907), No. 5, pp. 193–201.*)—A summary of data on mechanical, physical, and physiological changes in eggs, and those which are brought about by living organisms, particularly by bacteria.

Concerning crab extract, II and III, D. Ackermann and F. Kutscher (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 10, pp. 610–614*).—In addition to the constituents referred to in an earlier report (E. S. R., 18, p. 857), the authors identified hypoxanthin and betain as constituents of crab extract. Sarcolactic acid was also identified, but no succinic acid was found.

Artificial digestion experiments with a number of foods of vegetable origin, W. Rothe (*Ztschr. Physiol. Chem., 51 (1907), No. 3, pp. 185–200*).—Oatmeal, oat grits, barley grits, green wheat grits, rice, bean meal, pea meal, lentils, beans, and other similar materials soaked in water at body temperature were digested with hydrochloric acid and with gastric juice of different strengths.

Considerable differences were found in the foods studied in the amount of protein, which was rendered soluble, owing, in the author's opinion, to differences in their chemical properties. As has been pointed out by other investigators, heating, such as is practiced in the preparation of meal from legumes, renders the protein less soluble, while the reverse is true of the starch, owing to its inversion. Such treatment, however, lessens the time required for cooking. The author points out that some of the digestion coefficients were not what might have been expected; for instance, the protein of meal made from legumes went into solution very readily. Attention is also directed to the fact that the results of the experiments are relative rather than absolute.

The physiological behavior of inosit, P. Mayer (*Biochem. Ztschr., 2 (1907), p. 393; abs. in Chem. Ztg., 31 (1907), No. 31, Repert. No. 27, p. 166*).—As shown by the author's investigations, glycogen is not formed from inosit in the body.

Experimental studies on the nutritive value of meat powder, P. Lassablière (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 13, pp. 640, 641*).—Experiments made with dogs led the author to conclude that meat powder produces harmful effects and can not be considered a foodstuff.

Practical physiological chemistry, P. B. Hawk (*Philadelphia, 1907, pp. XIV+416, pls. 6, figs. 126*).—As the result of class room experience the author has prepared a handbook of physiological chemistry which contains a large amount of valuable material presented in a clear and logical manner. Carbohydrates, salivary digestion, proteids, the decomposition products of proteids, gastric digestion, fats, pancreatic digestion, bile, putrefaction products, feces, blood, milk, epithelial and connective tissues, muscular tissue and nervous tissue, urine, and the quantitative analysis of milk, gastric juice and blood are among the topics taken up. The chemistry of the different compounds under consideration, methods of detection and analysis and related questions are discussed. Special features of the volume are the data on the examination of feces for diagnosis and the discussion of the decomposition products of proteids. The subject of solid tissues has also been treated somewhat more fully than is usual in such textbooks.

The chemical coordination of the activities of the body, E. H. Starling *Sci. Prog. Twentieth Cent., 1 (1907), No. 4, pp. 557–568*).—The important part played by internal secretions in the regulation of the activities of the body has long been recognized by physiologists and available data on the subject are summarized and discussed by the author who, with his associates, has made important contributions to this line of physiological chemistry. He proposes the name "hormones" for these excitatory substances or "Reizstoffe," as they are sometimes called.

"Foodstuffs are valuable in proportion as they furnish energy to the organism or material for its construction and growth. These 'Reizstoffe' are, so far as we can tell, nonassimilable, and yield no appreciable amount of energy. It is their dynamic effects on the living cell which are of importance. In this respect they present a close analogy to the substances which form the ordinary drugs of our pharmacopœias." The author believes that these excitatory substances must be regarded as compounds "produced often in the normal metabolism of certain cells, of definite chemical composition, and comparable in their chemical nature and mode of action to drugs of specific action, such as the alkaloids."

The chemical coordination of body functions, E. H. Starling (*Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 2 (1907), Nos. 5, pp. 161–167; 6, pp. 209–214*).—This address, delivered before the Society of German Naturalists and Physicians, covers essentially the same ground as the paper noted above.

Experimental studies on psychic and associative secretion of gastric juice in man, H. Bogen (*Arch. Physiol [Pflüger], 117 (1907), No. 1–2, pp. 150–160*).—A secretion of gastric juice can be brought about in man by psychological means and by associative methods. Psychical effects, such as anger and pain, hinder its secretion. The quantity of secretion and duration of the activity of the secreting glands diminishes with a lessening of the intensity of stimulation. The hydrochloric acid and total acidity of the gastric juice are apparently also dependent upon the intensity of excitation.

Chemistry of digestion in the animal body, VIII, E. S. London (*Ztschr. Physiol. Chem., 51 (1907), No. 3, pp. 241–243, figs. 2*).—The author describes a method of operating on animals in order that digestive processes may be studied which he believes will yield good results.

An improved operative method of forming an experimental accessory (Pawlow) stomach in the dog, J. C. Hemmeter (*Amer. Jour. Physiol., 17 (1907), No. 4, pp. 321–325, figs. 6*).—This operation, which is described in detail, is of great importance in studying the physiology of digestion.

Further experiments on the value of deep-seated cleavage products of proteid, E. Abderhalden and B. Oppler (*Ztschr. Physiol. Chem., 51 (1907), No. 3, pp. 226–240*).—In the experiments reported, which were made with dogs, it was found that the products derived by the deep-seated cleavage of casein maintained nitrogen equilibrium for a considerable time.

Cleavage of food proteid in the intestine, II, O. Cohnheim (*Ztschr. Physiol. Chem., 51 (1907), No. 4–5, pp. 415–424*).—As shown by the experimental data reported, the successive action of digestive ferments upon meat protein produces as much arginin as does cleavage with acid.

Cleavage of gliadin by means of Bacillus mesentericus vulgatus, E. Abderhalden and O. Emmerling (*Ztschr. Physiol. Chem., 51 (1907), No. 4–5, pp. 394–396*).—Experiments show, according to the authors, that the cleavage of gliadin to fatty acids and other nitrogen-free cleavage products is due to the fact that the bacillus, aided by its ferments, first changes food protein into amido acids.

Further experiments on the assimilation of protein in the animal body, E. Abderhalden, C. Funk, and E. S. London (*Ztschr. Physiol. Chem., 51 (1907), No. 4–5, pp. 269–293*).—Meat gliadin and egg albumen were the proteids studied in experiments with dogs having Eck fistulæ. In no case was any of the food protein found in the blood, nor could it be shown that the composition of the food protein, and particularly it glutaminic-acid content, had an effect on the protein of plasma, or the proteids of the blood corpuscles. Cleavage products of protein were not found in the blood. (See E. S. R., 18, p. 67.)

Proof of the occurrence of dissolved proteid in adult feces, H. SCHLOESSMANN (*Ztschr. Klin. Med., 60 (1907), pp. 272–294; abs. in Chem. Abs., 1 (1907), No. 6, p. 742*).—The proteid in feces extract which may be precipitated by acetic acid consists principally of nucleo-proteid. Mucin, a substance of weakly reducing properties, is generally present in fresh feces. The nucleo-proteid content of adult feces is not changed by a diet rich in nucleins. In the feces of children such food results in an increased excretion of nucleo-proteid in the feces. Under pathological conditions there is generally an increase in this constituent. With the exception of the body under consideration no other proteid is found in feces in health. The proteid which appears in the feces pathologically is, generally speaking, albumin, though albumoses occur occasionally.

Day and night urines, E. OSTERBERG and C. G. L. WOLF (*Jour. Biol. Chem., 3 (1907), No. 2, pp. 165–169*).—The analytical data reported do not show any regularity in the volume of urine excreted, the excesses of excretion on each diet being equally divided between night and morning urines. Furthermore, no regularity was noted in the nitrogen or in the urea excreted. Except in one instance with a low protein diet the ammonia excreted in the night urine was greater than in the day urine.

The authors believe that their results indicate an increase in the excretion of creatinin in the day urine. "The amount is always higher during hours of work. . . . In each set the elimination of creatin was greater during the day than at night. The uric acid appears to follow to some extent the course of the creatinin, although during one period, the elimination is lower during a waking period."

The undetermined nitrogen of the urine was with one exception greater during the work periods. The elimination of sulphur showed more regularity than that of nitrogen, the total sulphur, total sulphates, and neutral sulphur being uniformly higher during waking than during sleep. In the case of ethereal sulphur, variations were noted, but they were not very large.

The analysis of urine in a starving woman, F. G. BENEDICT and A. R. DIEFENDORF (*Amer. Jour. Physiol., 18 (1907), No. 4, pp. 362–376*).—The observations reported were made with an insane woman who refused food.

"The volume of urine of a fasting woman (without water) may be as low as 237 cc. in 24 hours. . . . The nitrogen output during fasting increased for the first 3 days and then decreased. On one day, at the conclusion of the fast, the subject excreted but 3.17 gm. of nitrogen."

The elimination of creatin, F. G. BENEDICT and V. C. MYERS (*Amer. Jour. Physiol., 18 (1907), No. 4, pp. 406–412*).—Studies with insane patients led to the deduction that the experimental evidence at hand is as yet not sufficient to show clearly the relation between creatin output and disease. The available data would imply that creatin is excreted in wasting diseases where flesh is broken down.

The elimination of creatinin in women, F. G. BENEDICT and V. C. MYERS (*Amer. Jour. Physiol., 18 (1907), No. 4, pp. 377–396*).—The authors' summary of the experimental data presented follows:

"The creatinin excretion of women is, in general, much lower than that of men. While the excretion is, in general, proportional to the body weight, this is not always the case. Age appears to play an important rôle in the excretion of creatinin, since elderly people excrete less creatinin than younger people, with essentially the same body weight. The evidence furnished by the subject whose body weight varied considerably at times implies that the creatinin excretion is proportional to the body weight and not to the active mass of protoplasmic tissue.

Observations on nitrogenous metabolism in man after removal of the spleen, L. B. Mendel and R. B. Gibson (*Amer. Jour. Physiol., 18 (1907), No. 3, pp. 201–212*).—Analytical data reported did not indicate any striking variations from the normal distribution of urinary components which could be associated with the exclusion of the functions of the spleen.

The action of certain drugs on the elimination of uric acid during a nitrogen-free diet, H. C. Jackson and K. D. Blackfan (*Studies Bender Hyg. Lab., 3 (1906), pp. 24–41*).—In the experiments reported the diet consisted of a sort of pudding made from arrowroot, starch, cane sugar, butter fat in the form of cream, salt and extracts and fruits as flavoring material, the total energy value of the diet being 2,811 calories per day. From the standpoint of energy, the diet was found to be sufficient.

The conclusion was reached that the elimination of uric acid on a purin-free or nitrogen-free diet is not a constant value for the same individual. Apparently the elimination of creatinin may be altered by conditions other than that of creatinin in the food. Alcohol was found to increase the output of uric acid during a nitrogen-free diet. Other conclusions are drawn regarding the effect of this substance and of a number of drugs.

Concerning glycolysis, G. W. Hall (*Amer. Jour. Physiol., 18 (1907), No. 3, pp. 283–294*).—The experimental data reported confirm Cohnheim's conclusion that the pancreas alone can not destroy appreciable amounts of δ-glucose; "muscle alone can destroy small quantities of glucose; while small quantities of the expressed juice of pancreas mixed with muscle juice destroy considerable quantities of glucose. Even more effective in this cooperation than pancreas juice is the alcoholic extract of boiled pancreas.

"The active pancreatic substance is completely precipitated by phosphotungstic acid. Under the same circumstances neither arabinose, nor lactose, nor levulose in material quantity is subject to the same destruction.

"The action of bacteria to destroy glucose in these experiments is shown to have been absent by the failure of the mechanism with other sugars and by the proved sterility of the mixture. Trypsin or another constituent of the pancreas has a harmful effect upon the active muscle substance, a fact which may perhaps account for the apparent inhibition sometimes observed.

"In such experiments the use of a mixture of mono- and di-sodium phosphates to preserve neutrality is advantageous."

ANIMAL PRODUCTION.

Cassava: Its content of hydrocyanic acid and starch and other properties, C. C. Moore (*U. S. Dept. Agr., Bur. Chem. Bul. 106, pp. 30*).—Analyses were made of a number of varieties of cassava grown in Mississippi and Florida. The results suggest that the hydrocyanic-acid content may undergo a variety of changes during the growth of the plant and may even disappear entirely at times and again be present. In Florida-grown samples the maximum hydrocyanic-acid content appeared to be present about the middle of March.

"It is generally believed that the common stock of cassava known as the Florida Sweet is always sweet, and also that any variety brought into Florida will eventually become sweet. None of the common Florida varieties examined has shown more than a small quantity of hydrocyanic acid, and it appears therefore that the popular belief is well founded. The general results of the work indicate that the environment in Florida is such as to retard the chemical-physiological action which produces the hydrocyanic acid. It may be shown later that continued cultivation under such conditions will change the nature of the plant in this respect."

From a study of the form of tubers with reference to quality the author concludes that the oval form is preferable, as it is better adapted to harvesting and handling and contains a minimum percentage of surface or cortical layer, which would indicate an increase in the starch content and a decrease in hydrocyanic acid.

Experiments were made on the possibility of drying and grinding cassava on a small scale, the drying being carried on in trays. The mill used, when complete with shaft, box, and pulley, would cost $10 and would grind a ton of tubers in 1.5 hours. It was found that when dried under favorable conditions fine white meal was obtained, but if drying was prolonged the meal was discolored.

"When used for stock feeding, this discoloration is not objectionable. The greatest shrinkage in weight which occurred was 60 per cent, the meal then containing 8 per cent of moisture, and the average reduction in weight was 50 per cent.

"Meal prepared in this manner and kept for eight months has shown no signs of deterioration, which means that the product can be stored and marketed to much better advantage, and that the cost of transportation, which is one of the principal factors in the profitable production of this crop, has been reduced one-half."

The possibility of the meal being poisonous if used as cattle feed through the liberation of hydrocyanic acid was studied by treating 540 gm. with water and distilling. Only a trace of hydrocyanic acid was found in the distillate.

The importance of cassava meal as a human food, and other questions concerned with yield and varieties, are considered.

The value of feeding materials (*Oklahoma Sta. Rpt. 1907, pp. 34–38*).— Under the provisions of the State law, 26 samples of feeding stuffs were analyzed, including condimental stock and poultry foods and cotton-seed and linseed meal. With regard to the patented stock foods, attention is drawn to the fact that with one exception the samples analyzed were very low in both protein and fat and that they have a feeding value equal to about one-third that of cotton-seed or linseed meal.

"As a medicine or tonic for stock, it is claimed that these foods prevent or cure diseases, fatten run-down stock, aid other foods in the laying on of fat, cause milch cows to give more and richer milk, and reduce the net cost of flesh put on animals during the fattening period. These claims are enormously exaggerated and actual experiment has proven that in most cases these foods are of no value whatever as flesh or milk producers. Foods of this class sell for 10 to 25 cts. per pound and any farmer could duplicate them at a cost of about 1 ct. per pound in most cases. Preparations advertised as foods and medicines are open to suspicion, and when sold as high-class foods and at the same time the claim is made that they are a panacea for all kinds of live-stock ailments they should be condemned.

"Some of these foods contain a laxative, such as Epsom or Glauber's salts, in amounts equal to 15 to 25 per cent of the entire weight. Most of them contain an irritant or stimulant, such as large quantities of pepper, mustard, bark, or charcoal. Table salt is usually present in large quantities. The greater bulk of these foods consists of corn and wheat brans, ground grain, or greater or less quantities of linseed meal. Oat hulls, pine and poplar bark, lime, Venetian red, and ground oyster shells are some of the substances found in foods of this class. Nearly all of them contain some such substance as anise, fenugreek, or fennel to give them an odor. A few of them contain, in small quantities, a valuable tonic such as gentian.

The digestibility of molasses feeds, H. J. Patterson and R. Outwater (*Maryland Sta. Bul. 117, pp. 259–290*).—Using steers as subjects the effects of molasses on the digestibility of hay and on the digestibility of a mixed-grain ration were studied, as well as the digestibility of two commercial molasses feeds and the influence of molasses on the metalbolism of nitrogen.

The results given in the following table are the average for four animals in every case except for hay and molasses, where only two steers were used:

Coefficients of digestibility of rations with and without molasses—Experiments with steers.

Kind of ration.	Dry substance	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Sugars before inversion.	Sugars after inversion.	Ash.
	Per ct.	*Per ct*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Hay	48.4	44.3	51.3	47.0	32.1	78.9	84.0	17.2
Hay and molasses	57.6	38.3	52.9	63.7	27.0	94.6	97.7	14.1
Mixed grain	64.9	67.1	16.8	72.1	93.3	107.1	103.6	18.1
Mixed grain and molasses	78.9	71.5	40.2	88.6	102.0	98.9	99.9	49.4
Sucrene	66.9	65.2	34.1	75.4	97.5	97.9	97.7	39.1
Mueller's molasses grains	68.1	57.3	28.9	83.2	102.8	99.8	100.4	38.8

The conclusions which were drawn follow:

"These results show that the addition of molasses to a ration has a tendency to increase the digestibility of both hay and grain feeds. This, coupled with the generally observed fact that molasses contributes toward making feeds more palatable and also acts as an appetizer, gives to molasses a relatively high place as a stock food and makes it more valuable than its analysis alone would indicate.

"The results obtained with sucrene and Mueller's molasses grains, when compared with those obtained for the mixed-grain ration used, show quite evidently that the molasses which they contain has contributed toward making them more digestible and giving them a higher feeding value than they would have had without the molasses. The mixed-grain ration used contained a greater variety of grains than is used by most dairymen and probably average well with any in quality, yet both the sucrene and Mueller's molasses grains showed a higher digestibility.

"In studying these figures the point is noticed that the protein is sometimes not so digestible in the presence of molasses, and this suggests the thought that it may be that the presence of the readily available energy of the molasses has filled the requirements of the animal and thus not necessitated the breaking up of more difficult protein compounds."

The recorded data do not show that molasses exercised any effect upon the metabolism of nitrogen. The feeding stuffs used were analyzed.

Feeding experiments with cattle, sheep, swine, and horses, R. W. Clark (*Utah Sta. Bul. 101, pp. 165–179, 188–201*).—The principal question studied was the value of sugar-beet pulp for farm animals, though tests of the value of apples for pigs and of gains made by different breeds are also reported.

In a test of the value of beet pulp and alfalfa with and without grain made with 5 lots of 5 steers each the greatest gain per head per day in a 70-day period, 2.06 lbs., was made by a lot fed a daily ration of alfalfa and beet pulp ad libitum with 4 lbs. of grain, and the smallest gain, 1.37 lbs., with a lot fed alfalfa and beet pulp ad libitum without grain. The gain was most expensive, costing 7.31 cts. per pound, on alfalfa and beet pulp ad libitum, and was least expensive, costing 3.83 cts., on alfalfa ad libitum and one-half as much pulp.

In a similar test made with 6 lots of 15 sheep each the gains ranged from 0.2 lb. per head per day with the lots receiving, respectively, alfalfa and beet pulp ad libitum with and without 0.5 lb. of grain per head per day to 0.31 lb. per head per day with the lot receiving alfalfa and beet pulp ad libitum with 1 lb. of grain. Gain was most expensive with the last-mentioned lot, costing 5.15 cts., and was cheapest, 3.18 cts., with the lot fed alfalfa and a half ration of beet pulp.

When sugar beets were added to alfalfa and grain a lot of 4 steers made an average daily gain of 1.56 lbs. per head in a test covering 100 days, while 5 steers fed a similar ration without sugar beets gained 1.13 lbs. The cost of a pound of gain in the 2 cases was 9.6 and 7.3 cts., respectively.

When similar rations were tested with sheep the average daily gain with beets was 0.35 lb. per head and without beets 0.22 lb., the period covering 137 days. The cost of a pound of gain in the 2 cases was 6.9 and 5.7 cts., respectively.

To secure data regarding the effects of beet pulp on the strength of bone a lot of 3 wethers was fed 10 lbs. of pulp per head per day, while a similar lot received no pulp. The strength of a number of the more important bones was determined with a testing machine and in every case it was found that there was a difference in favor of the pulp ration.

Beet pulp as part of a ration was studied with 2 pairs of work horses for 2 periods of 28 days each, one horse in each team receiving pulp and the rations being reversed during the second period. An average loss of 6 lbs. per head was noted on the pulp ration and of 2 lbs. on the ration without pulp. "As high as 20 lbs. of pulp was fed to horses per animal per day without any apparent injury. In a ration of alfalfa hay and oats 9 lbs. of well-fermented solid pulp saved 1.5 lbs. oats. . . . The horses took to the pulp reluctantly and their appetite for it gradually decreased." Colts have been allowed constant access to pulp, according to the author, for several years and in no instance has trouble arisen from it so far as is known.

In tests of the value of sugar-beet products for pigs it was found that 5 pigs, fed green alfalfa, skim milk, and shorts, with molasses, made an average daily gain of 1.03 lbs. per head in a 58-day feeding period as compared with 0.85 lb. per head per day with a lot of 4 pigs fed a similar ration without molasses. The cost of a pound of gain in the 2 cases was 2.43 and 2.92 cts., respectively.

In a second test shorts with and without beet pulp, with sugar beets, and with pulp and molasses were compared in a period covering 48 days. The gains ranged from 1.2 lbs. per head per day on both the shorts and beet pulp and the shorts and sugar-beet rations to 1.73 lbs. on shorts alone, and the cost from 2.21 cts. on shorts, pulp, and molasses to 3.71 cts. on shorts and sugar beets.

When shorts and skim milk with and without beet pulp or sugar beets were studied the smallest gain, 1.07 lbs. per pig per day, was made by the lot fed the skim milk and beet-pulp ration, and the greatest gain, 1.36 lbs., by the lot fed shorts and skim milk only. The gain was least expensive, costing 3.38 cts. per pound, on shorts, skim milk, and beet pulp, and most expensive, costing 3.93 cts. per pound, on shorts, skim milk, and sugar beets.

When apples as part of a ration were fed to pigs receiving shorts and skim milk the average daily gain per head in 2 tests with apples was 1.6 lbs. and without apples 1.4 lbs. The calculated value of the apples, according to the author, ranged from nothing to 18 cts. per 100 lbs.

When apples and shorts were fed in comparison with pasturage and shorts to 2 lots of 3 pigs each they were found to have a feeding value about equal to grass, the average daily gain being 0.59 lb. per pig on the apple ration and 0.56 lb. on pastaurage.

In a grazing experiment covering 107 days made to study the relative merits of different breeds of pigs, the results were very similar, ranging from 0.7 lb. per head per day with Yorkshires to 0.78 lb. with Tamworths. "As grazers, pure-bred Tamworth swine were most superior. Berkshire, Poland China, and Tamworth grades were about equal. Pure-bred Yorkshires were not equal to the other breeds in feeding qualities, especially as grazers."

From a summary of data regarding the cost of raising pigs and cattle the following deductions were drawn:

"The average cost of spring litters of 6 pigs each, including the cost of the keep of the sow for one year, when disposed of at a weight of 893 lbs., was $29.42. The average cost of fall litters of 7 pigs each, including the cost of the keep of the sow for one year, when disposed of at a weight of 1,088 lbs., was $36.90. The cost per hundred for spring pigs from weaning to a weight of 150 lbs. was $2.70, and of fall pigs fed through the winter to a weight of 135 lbs. was $2.77.

"The average cost of raising cattle to one year of age was $19 per head, and to two years of age, at which time they averaged 1,037 lbs. in weight, was $36.97."

Tests similar to those noted above were also made with milch cows. (See p. 369.)

Experiments in swine feeding. The value of corn and supplementary feeds for pork production, W. J. Kennedy and E. T. Robbins (*Iowa Sta. Bul. 91, pp. 61, figs. 23*).—Corn meal alone and with varying proportions of ground barley, wheat shorts, meat meal, and tankage was compared in tests with pigs, as were also the relative merits of dry-lot feeding and pasturage and of timothy and clover pasturage.

Four lots of 12 well-grown pigs each were used in the first test, comparing corn alone and with supplementary feeds, and the daily gains made in 32 days on the several rations were per head as follows: Corn, 1.88 lbs.; corn, barley, and shorts 2:1:1, 2.21 lbs.; corn and meat meal 9:1, 2.68 lbs.; and corn and tankage 9:1, 2.34 lbs.

When different amounts of meat meal supplementing corn meal were studied with 4 lots of 9 young pigs each, the average daily gain per head was 1.16 lbs. on corn meal alone, 1.75 lbs. on corn meal and meat meal 7:1, 1.79 lbs. on corn meal and meat meal 8.5:1, and 1.86 lbs. on corn meal and meat meal 10:1.

The feed eaten per pound of gain in the above 2 tests ranged from 3.7 lbs. with the mature pigs on corn and meat meal 9:1 to 5.57 lbs. with young pigs on corn meal alone. The gain was most expensive with the latter lot, costing 3.97 cts. per pound, and was least expensive, costing 3.15 cts., with the mature pigs fed corn meal, barley, and shorts.

A comparison of dry-lot feeding and pasturage and of the effects of supplementing corn by other concentrated feeds under these conditions was undertaken with 10 lots containing 10 pigs each at the beginning of the trial, the test as a whole covering 112 days. When corn and shorts 2:1 and 1:1, corn meal and meat meal 5:1, and corn meal and tankage 5:1 were fed with timothy pasturage, the average daily gain ranged from 1.12 lbs. on corn and shorts 2:1 to 1.37 lbs. on corn and tankage 5:1. In the case of the same rations fed without pasturage the gain ranged from 0.81 lb. on corn and shorts 2:1 to 1.09 lbs. on corn and meat meal. On corn and timothy pasturage alone the average daily gain was 0.92 lb. per pig and on corn and clover pasturage 1.19 lbs. Considering all the lots the concentrated feed eaten per pound of gain ranged from 3.98 lbs. with the lot fed corn and shorts 1:1 on timothy pasturage to 5.12 lbs. with the lot fed corn and shorts 2:1 in a dry yard, and was on an average 4.29 lbs. The cost of a pound of gain ranged from 3.35 cts. with the lot pastured on clover and fed corn to 4.46 cts. with the lot on corn and shorts 2:1 fed in a dry yard, and was on an average 3.92 cts.

In these tests data are given regarding the shrinkage on slaughtering and the profits are discussed at length on the basis of corn meal, meat meal, and tankage at different prices. Some of the conclusions which were drawn follow:

"Meat meal and tankage of similar chemical composition are almost equal, pound for pound, as a supplement to a corn ration for growing pigs and fattening hogs. . . .

"At the prevailing market prices, a ration of corn alone on timothy pasture produced the cheapest gains in weight of any of the rations fed to pigs on timothy pasture, but the mixed rations produced the greatest total net profits.

"Hogs fed on rations composed of corn and meat meal and corn and tankage were fully as acceptable to the buyers, both from the standpoint of the quality and condition of the flesh, as those fed on any of the other rations tested. . . .

"Both meat meal and tankage are more valuable and profitable adjuncts to the corn ration for dry-lot feeding than when pigs or hogs are being developed and fattened on pasture, especially if the pasture be composed of leguminous crops. . . .

"For feeding pigs on pasture with feeds at the prevailing prices, a ration of corn alone produced 100 lbs. of gain at a smaller cost than a ration of corn and shorts. The corn and shorts ration, however, yielded somewhat the greater total profit, due to the more rapid gains produced from the use of the same.

"At the prevailing market price, barley proved to be an economical feed when combined with corn and shorts for finishing hogs for market.

"Pigs on timothy pasture ate more concentrated feed and gained more rapidly than pigs eating the same kind of concentrated rations in dry lots. . . .

"The gains due to the pasture itself were greatest when relatively smaller amounts of protein were supplied in the concentrated part of the ration, and amounted to 278 lbs. of pork per acre from timothy pasture when a concentrated ration composed of 2 parts corn and 1 part shorts was fed after 1.85 tons of hay had been harvested four weeks before the experiment commenced. The ration composed of corn and clover pasture produced 116 lbs. more pork per acre than the ration composed of the same number of pounds of corn and timothy pasture. . . .

"In dry-lot feeding the most rapid gains and the most economical gains were obtained in these experiments from those rations containing a much larger proportion of protein to the carbohydrates and fats than is found in corn. The price which feeders can afford to pay for supplementary feeds, rich in protein, to add to the corn ration for the purpose of balancing the same must be regulated by the percentage of digestible protein contained in them and the market price of corn. When corn is high in price, supplementary feeds, as a rule, can be had at prices which will not prohibit their use; but when corn is very low in price the feeder will very likely lose a portion, if not all, of his profits in pig feeding through the purchase of supplementary feeds."

The feeding stuffs were analyzed.

Experiments in swine feeding, L. E. CARTER (*Iowa Sta. Bul. 91, popular ed., pp. 17*).—A popular edition of the above.

Pig feeding, J. J. VERNON and J. M. SCOTT (*New Mexico Sta. Bul. 62, pp. 20, pls. 4*).—A test was made of the value of different proportions of alfalfa hay and corn and of alfalfa alone with 4 lots of 7 pigs each. In 73 days the pigs on alfalfa and corn 1:3 made an average daily gain of 1.02 lbs. per head, on equal parts of alfalfa and corn of 1.02 lbs., on alfalfa and corn 3:1 of 0.59 lb., and on alfalfa alone 0.21 lb. The feed required per pound of gain ranged from 4.87 lbs. on alfalfa and corn 1:3 to 15.67 lbs. on alfalfa alone. The gain was most cheaply made at a cost of 4.51 cts. per pound on alfalfa and corn 3 : 1 and was most expensive on alfalfa alone, costing 5.48 cts. per pound.

In a supplementary period of 31 days the lot which had been fed alfalfa alone was given a ration of alfalfa and corn 1 : 1.2, and made an average daily gain per head of 0.85 lb. at a cost of 6 cts. per pound, and requiring 6.78 lbs. of feed per pound of gain.

The calculated return per ton of alfalfa hay ranged from $4.93 for the lot fed alfalfa hay alone to $34.68 on alfalfa and corn 1 : 3.

"Hog raising in New Mexico is an undeveloped industry, although the conditions are very favorable in many sections.

"Alfalfa, the leading crop in New Mexico at the present time, forms an excellent pig feed when combined with grain.

"Alfalfa fed alone is a very poor food for fattening pigs.

"In order to prevent undue waste when feeding alfalfa to pigs, the hay should be fed in a slatted rack placed in a flat bottomed trough. The spaces between the slats should not exceed 2.5 inches and the trough should extend at least 18 in. beyond the rack in every direction. The coarse stems left by the pigs may be fed to stock cattle."

The bulletin contains some notes on swine diseases, though the authors state that up to the present New Mexico pigs have not been seriously menaced by diseases.

Animal husbandry, J. J. Vernon (*New Mexico Sta. Rpt. 1906, pp. 24–29*).—An experiment on pig feeding is reported which has been noted from another publication. (See p. 366.)

Finishing hogs for market, C. L. Willoughby and P. N. Flint (*Georgia Sta. Circ. 61, pp. 8, figs. 2*).—With a view to studying the possibilities of producing fat and lean carcasses a pig weighing 138 lbs. was started on a ration of 5 lbs. shorts, 2 lbs. bran, and 6 lbs. skim milk in comparison with a similar pig on a ration of 7 lbs. of shelled corn per day, the quantities in each case being increased as the test continued. In 61 days the pig fed the mixed ration made an average daily gain of 1.08 lbs., while the pig fed the fattening ration of corn gained on an average 1.07 lbs. per day. The cost of a pound of gain in the 2 cases was 8.7 and 8.8 cts., respectively, and the digestible nutrients required per pound of gain 4.67 and 5.59 lbs. The proportion of dressed weight to live weight was practically the same for the 2 pigs, being 77 and 78 per cent, respectively. The pig fed corn showed considerably more lard and body fat than the pig fed the mixed ration. The authors' conclusions follow:

"Hogs fed on protein material such as shorts and skim milk will make more muscle and better bone than hogs fed on a diet of corn.

"It requires less feed (digestible) to produce the same gain when using a large percentage of protein than when feeding corn alone.

"A large share of the flesh is converted into lean meat when feeding a protein ration; a corn ration produces considerably more lard and cheap body fat.

"The cheapest method of raising pigs from weaning time is to use good range, pasture, forage and root crops, with a small quantity of grain. This gives a start toward lean meat production.

"Although certain breeds belong pre-eminently to the bacon or lean meat type, yet all hogs at present grown in Georgia can be fed so as to produce the lean type of carcass by properly balancing their feed with protein materials during the final finishing or fattening period.

"Local butchers and the consumers of pork should be educated as to the superior merits of animals finished by the 'lean meat' method of feeding; and the producers of this class of meat should soon ask and secure a higher price per pound for their product than for pork that is fattened by the exclusive corn method."

Poultry experiments, J. DRYDEN (*Utah Sta. Bul. 102, pp. 203–228, figs. 8*).—Continuing earlier work (E. S. R., 17, p. 390) studies were made of the effects of housing on egg fertility and of the effects of a number of conditions during incubation on the proportion of eggs which hatched, and related questions.

The average fertility of eggs laid by hens in a house artificially heated in winter and in an open-front house was each 70 per cent, in a house with no artificial heat 77 per cent, and in a colony house with free range 74 per cent. The percentage of fertile eggs hatched ranged from 33 with the hens in a house artificially heated to 55 in the case of those in an open-front house, and the weight per egg from 1.89 oz. in the case of pullets in an open-front house to 2.15 oz. in the colony house with the free range. On the whole the results are in favor of the colony house as regards egg yield. The fowls in the colony house had free range, and in every other case they had access to yards, and during the winter, when snow was on the ground, were given no water. "They apparently did not suffer from the eating of snow or the lack of water."

In tests to determine the effect of medium and maximum moisture content of the air of incubators as compared with no moisture, it was found that "Nearly 100 per cent better hatches were obtained by the use of moisture, and there was no contradiction in all of the tests." The relative humidity of the air in the "no moisture" machines was about 51° and in the other incubators about 57°. The relative weight of the chickens hatched in the "maximum moisture" incubator was 1.184 oz., in the "medium moisture" incubator 1.159 oz., and in the "no moisture" incubator 1.072 oz. The weight of a hen-hatched chick was 1.258 oz. The results of these weighings "would indicate that vigor in the chicks demands a greater amount of moisture during incubation than the incubator, as at present made, can furnish." The author also believes that proper germ development does not take place unless the humidity conditions are favorable, for the records obtained show that a larger number of eggs were removed as infertile or having dried germs from the dry than from the moist incubators.

The evaporation from the eggs in the machine with maximum moisture was 12.28 per cent, in that with medium moisture 14.05 per cent, and in that with no moisture 17.78 per cent.

When trays of water were used as a source of moisture instead of trays of moistened sand, the relative loss of weight in eggs during incubation was 16.13 as compared with 12.28 per cent. "The sand is therefore more effective as an evaporating surface than water."

Tests were made of the amount of carbon dioxid in the air of the incubators, but in the author's opinion the values obtained apparently do not bear any relation to the number of chicks hatched. Tests of the air under sitting hens showed 141.1 parts of carbon dioxid per 10,000 parts of air, and practically the same amounts of carbon dioxid were found with a hen sitting on china eggs as on hens' eggs, so "there seems to be no question from these results that the hen gives off large quantities of carbon dioxid from her body." The fact that in incubators the carbon dioxid found comes largely from the eggs, while in natural incubation it comes from the hen's body "indicates a vital difference in the conditions of artificial and natural incubation." On the whole, the investigations "have shown large quantities of carbon dioxid in natural incubation and relatively small amounts in artificial incubation, but increasing artificially, the supply of carbon dioxid seems rather to have an injurious effect in artificial incubation."

Poultry division, F. B. LINFIELD (*Montana Sta. Rpt. 1906, pp. 124–127*).—Improvements in the station poultry plant are described and the egg records of 14 pens of station poultry recorded. The principal object of the station poultry work is the development of large laying strains of different breeds.

A gasoline heated colony brooder house, J. E. Rice and R. C. Lawry (*New York Cornell Sta. Bul. 246, pp. 137–176, figs. 22, plans 7*).—Detailed plans are given for the construction of a brooder house and heating appliances using gasoline as fuel, which have given good results. Data are also included regarding the evolution of gasoline heaters, the construction, operation, and comparative value of different burners, and related questions.

In the authors' opinion there is no danger in operating a gasoline burner provided ordinary care is observed. "The common points of error often resulting disastrously are: (*a*) Allowing too much gasoline to run into the generating cup; (*b*) applying a match to the generating cup before the control valve is closed; (*c*) attempting to light the burner after it has been blown out by the wind or in some other manner and the bottom of the burner box is covered with gasoline."

New poultry appliances, J. E. Rice and R. C. Lawry (*New York Cornell Sta. Bul. 248, pp. 205–228, figs. 37*).—Detailed descriptions are given of a number of poultry appliances, including a trap nest, a feed and a gravel hopper, feed supply can, egg distributing table and carrying box, combination crate for eggs and dressed poultry, water pan and cover, device for carrying kerosene oil to incubator cellar, catching hook, chicken feed trough, a removable floor for chicken shelter, and a system for keeping laying records.

Different methods of preserving eggs, R. Nourissé (*Les Divers Procédés de Conservation des Oeufs. Paris: Société d'Editions Techniques, 1907; rev. in Hyg. Viande et Lait, 1 (1907), No. 5, pp. 222, 223*).—The preservation of eggs by cold storage and by different preservative solutions, evaporated eggs, and related questions are considered.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Feeding sugar beets and sugar-beet pulp to dairy cows, R. W. Clark (*Utah Sta. Bul. 101, pp. 159–165, dgms. 2*).—In experiments on the feeding of sugar beets, the quantity of beets fed was small at the beginning but gradually increased until the cows, averaging about 1,100 lbs. in weight, consumed 30 to 40 lbs. of the beets each per day. The total ration per cow in the average of the experiments of 2 years was 21 lbs. of alfalfa, 5.9 lbs. of grain, and 33 lbs. of beets per day. The corresponding ration without beets was 25 lbs. of alfalfa and 5.9 lbs. of grain. The cows produced a little more milk and butter fat on the ration with beets than on that without them. The food cost of the milk was 77 cts. per hundred pounds and of the butter fat 18.9 cts. per pound with the former ration, whereas it was 50 cts. per hundred pounds for the milk and 12.8 cts. per pound for the butter fat with the latter ration. The milk flow was maintained as well with one ration as with the other.

In similar experiments with beet pulp, cows consuming 25 lbs. of alfalfa, 5.3 lbs. grain, and 28 lbs. of pulp each produced milk at 49.2 cts. per hundred pounds and butter fat at 12.9 cts. per pound, whereas on the same ration without pulp they produced milk at 44 cts. per hundred pounds and butter fat at 12.3 cts. per pound.

From his experiments the author concludes that (1) sugar beets and beet pulp for dairy cows are nearly equal in value; (2) the milk from beet and pulp-fed cows was a trifle higher in butter fat, the increased percentage being very small, and (3) the milk flow and daily yield of butter were maintained as well without beets and pulp as with them.

Feeding different amounts of grain to dairy cows, R. W. Clark (*Utah Sta. Bul. 101, pp. 179–188*).—Cows averaging 1,178 lbs. in weight produced more milk and butter fat on a ration of 12 lbs. of alfalfa and 15 lbs. of grain per day than with a ration of 25 lbs. of alfalfa and 4 lbs. of grain, but in the former case the food cost of the milk was 83 cts. per hundred pounds and of the butter fat 18.7 cts. per pound as compared with 53 cts. per hundred pounds for the milk and 13 cts. per pound for the butter fat in the latter ration.

Cows averaging 1,035 lbs. in weight produced milk at a food cost of 53 cts. per hundred pounds and butter fat at 12.9 cts. per pound on a daily ration of 23.1 lbs. of alfalfa and 8 lbs. of grain, whereas on a ration of 26.3 lbs. of alfalfa and 4 lbs. of grain they produced milk at 85 cts. per hundred pounds and butter fat at 11.3 cts. per pound.

With cows averaging 1,045 lbs. in weight and receiving a daily ration of 17.1 lbs. of alfalfa, 9.8 lbs. of grass hay, and 4 lbs. of grain the food cost of 100 lbs. of milk was 47 cts. and of 1 lb. of butter fat 12.4 cts. On a daily ration of 16.6 lbs. of alfalfa, 10 lbs. of grass hay, and 8 lbs. of grain the cost was 57 cts. per hundred pounds for the milk and 15 cts. per pound for the butter fat.

The author concludes from his experiments that the daily yield of milk and of butter fat was greater and the milk flow was maintained better on the larger than on the smaller amount of grain fed with alfalfa, but that the milk and the butter fat were produced cheaper with the smaller grain ration. In these experiments 13 lbs. of good alfalfa hay was nearly equal in value to 11 lbs. of grain, as a supplement to a basal ration of 4 lbs. of grain and 12 lbs. of hay.

Milking machines, W. A. Stocking, Jr., C. J. Mason, and C. L. Beach (*Connecticut Storrs Sta. Bul. 47, pp. 101–138, figs. 10*).—Part 1 of this bulletin, by W. A. Stocking, jr., and C. J. Mason, gives the results of studies of the effect of milking machines upon the quality of milk and part 2, by C. L. Beach, studies of the effect upon milk yield.

Effect upon quality of milk.—In 9 experiments the milking machine was treated in different ways and the bacterial content of the machine-drawn milk was compared with that of hand-drawn milk.

In the first experiment the machine was at night simply rinsed by pumping warm water through it and after use in the morning taken apart, scrubbed with hot water and washing powder, and rinsed with clean water. The pails were sterilized by steam. The bacterial content of the machine-drawn milk averaged 15,524 per cubic centimeter and of the hand-drawn milk 3,144.

The machine was next treated as in the first experiment but in addition the rubber tubes and teat cups were kept from morning until evening in a 1 : 300 solution of a washing powder. The bacterial content of the machine-drawn milk averaged 43,122 per cubic centimeter and of the hand-drawn milk 18,729.

In the third experiment the tubes and cups were kept in a 2.5 per cent solution of formalin between milkings, other conditions being the same as in the previous experiments. The tubes were made practically sterile by this treatment and the rubber was not injured. The tin-covered teat cups, however, were somewhat corroded. The average bacterial content of machine-drawn and hand-drawn milk was respectively 20,225 and 23,329 bacteria per cubic centimeter.

In the fourth experiment all parts of the machine were sterilized by steam. This was found very injurious to the rubber. The average bacterial content of the machine-drawn and hand-drawn milk was respectively 19,984 and 18,172 bacteria per cubic centimeter.

In the fifth and following experiments a new style of connector was used, which admitted air into the teat cups to relieve suction. The tubes and cups were kept in a 10 per cent salt solution between milkings. This treatment did not render the tubes sterile, and the brine itself was found to increase in germ content from day to day. The machine-drawn milk contained on an average 12,962 bacteria per cubic centimeter and the hand-drawn milk 10,806.

The tubes and cups were next kept in a borax solution made by dissolving 1 lb. of borax in 15 qt. of water. This did not sterilize the apparatus. The machine-drawn milk contained 17,817 bacteria per cubic centimeter and the hand-drawn milk 8,767.

In the seventh experiment the authors returned to the formalin treatment, using 3.5 per cent, but still the machine-drawn milk contained more bacteria than the hand-drawn milk, the averages being, respectively, 7,857 and 6,355 bacteria per cubic centimeter.

The formalin treatment was continued in the next experiment, but the air taken into the teat cups was filtered through absorbent cotton. This reduced the bacteria in the machine-drawn milk to 1,578 per cubic centimeter, while the average number in the hand-drawn milk was 4,560. In a second series in which the cotton filters were omitted the average bacterial content of the machine-drawn milk was 11,521, and of the hand-drawn milk 7,467.

In the final experiment lime water was used in the place of the formalin solution. The bacterial content of the machine-drawn milk was 55,367 and of the hand-drawn milk 5,908.

The formalin treatment was, therefore, the only one tried which was efficient in sterilizing the apparatus and at the same time was not injurious to the rubber.

In most cases the machine-drawn milk, notwithstanding the bacterial content was frequently higher, kept sweet longer than the milk drawn by hand.

Effect upon milk yield.—This part of the bulletin gives the yield of cows milked by hand and by machine. The results are submitted without discussion or comment, the work being considered too limited to warrant any conclusions.

Comparative studies with covered milk pails, W. A. Stocking, Jr. (*Connecticut Storrs Sta. Bul. 48, pp. 73–103, figs. 12*).—The author has tested several styles of covered milk pails taking the number of bacteria in the freshly drawn milk as an indication of the amount of external contamination. The different pails used are described and illustrated. The general conclusions drawn from the work as a whole are as follows:

"The use of the covered milk pail is of great advantage in any stable in excluding dirt and bacteria from the milk. The relative advantage gained by the use of the cover depends upon the sanitary condition of the stable.

"The special form of cover does not seem to be important provided it is a device practical for use and the area through which dirt can gain access to the milk is reduced as much as possible.

"Whether or not a strainer on the covered pail is desirable depends upon the style of the straining device.

"The use of the strainer in a pail where the dirt which falls into the opening is likely to be driven through by the succeeding streams of milk is not desirable. Its use tends to increase the germ content of the milk and injure its keeping quality.

"In pails where the dirt which falls in does not remain where the succeeding streams strike against it a strainer cloth aids in keeping down the number of bacteria which gain access to the milk. . . .

"The use of absorbent cotton as a strainer . . . is a decided advantage in preventing the entrance of bacteria into the milk."

Biological and biochemical studies of milk. V, Enzyms, C. J. Koning (*Milchw. Zentbl., 3 (1907), No. 6, pp. 235–261, figs. 2*).—The catalase content of milk, according to the author, increases with the age of the cow and with the bacterial content of the milk. His experiments indicated that this enzym is not produced by lactic-acid bacteria but by other organisms, such as those of the subtilis group, and for that reason he thinks that the determination of catalase may be made of value in judging the quality of milk, especially for infant feeding.

Biological and biochemical studies of milk. VI, Colostrum, C. J. KONING (*Pharm. Weekbl., 1907; abs. in Rev. Gén. Lait, 6 (1907), No. 12, pp. 282–285*).—According to the author's conclusions colostrum is at first very rich in catalase and diastase and poor in reductase. The percentages of albumin, solids-not-fat, and ash are at first high and the fat and sugar low. The colostral period for the cow ought to be placed at 3 weeks. Just before the end of the lactation period the milk becomes abnormal, a notable feature being an increase in the diastase, catalase, and reductase. In both colostrum and fresh milk the content of catalase and reductase is independent of the action of bacteria.

From studies of human milk and of the colostrum and milk of goats, sheep, and other animals the author concludes that it is not possible to prepare a milk for infants which shall possess the biochemical properties of human milk.

Some diastases of milk, A. MONVOISIN (*Rev. Gén. Lait, 6 (1907), No. 12, pp. 265–272*).—The author has studied the effect of oxygen upon the reductase in milk. This enzym was found to be reduced in amount but not destroyed by the treatment of milk with hydrogen peroxid for the purpose of sterilizing it. The use of formaldehyde with methylene blue as a test for reductase was found more delicate than the use of ethyl aldehyde or methyl aldehyde.

The acidity of milk, its relation to coagulation by heat and alcohol, its determination and its course during souring, I and II, T. HENKEL (*Milchw. Zentbl., 3 (1907), Nos. 8, pp. 340–369; 9, pp. 378–405*).—The acidity of fresh milk varied in 10,000 determinations from 5.5 to 9° (cubic centimeters of N/4 sodium hydroxid solution required to neutralize 100 cc. of milk). The variations in the mixed milk of a herd were between 6.8 and 7.5°. The variations between the morning and evening milk were very small. The acidity of the first and last portions of a milking was generally the same. Occasionally there were marked differences in the acidity of the milk from the different quarters. In general there was a slight decrease in the acidity of milk during the course of lactation. The acidity of colostrum was very high, in one instance 23.6°. The acidity was not affected by sexual heat but was by diseased conditions. No marked influence could be attributed to changes in rations fed.

Fresh milk was not coagulated in any instance by the use of 68 to 70 per cent of alcohol in the ordinary amount. Samples of milk coagulating with alcohol under identical conditions often showed marked differences in acidity.

The milk and cream supply of cities, J. MOLDENHAWER (*Salem, N. Y.: Author, [1907], pp. 80, figs. 10*).—In this little book the author discusses in a popular manner a great many topics bearing upon the improvement of city milk supplies and makes many suggestions based upon his own experience. The pasteurization of milk is especially urged.

Municipal regulation of the milk supply, G. W. GOLER (*Jour. Amer. Med. Assoc., 49 (1907), No. 13, pp. 1077–1079*).—The author outlines what city ordinances should require in regard to milk supplies and discusses the means of enforcing them.

Sanitary milk production (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 114, pp. 38*).—This is a report of a conference appointed by the Commissioners of the District of Columbia to consider and report upon the local milk supply, to advise what steps should be taken to improve it, and to suggest legislation to that end.

The conference recommends that 3 grades of milk be recognized by law, namely, certified milk, inspected milk, and pasteurized milk. These terms are clearly defined. Numerous recommendations are made with a view to securing a better supervision of the milk supply of the District and suggestions are made concerning the duties of consumers.

The following papers are included in the report: Diseases and Conditions of Cattle that may Affect the Quality of the Milk, by J. R. Mohler; Milk Sediments or Dirty Milk in Relation to Disease, by G. M. Kober; Sanitary Inspection of Dairies and Distributing Depots, by E. H. Webster; The Water Supply of Dairy Farms, by G. L. Magruder; Milk during Transportation, by E. Berliner; Commercial Classes of Milk, by A. D. Melvin; and Pasteurization, by M. J. Rosenau.

Several committee reports are also included.

The milk supply of Washington, D. C., G. L. MAGRUDER (*Jour. Amer. Med. Assoc., 49 (1907), No. 13, pp. 1088, 1089*).—A brief statement relating to the studies being made of the milk supply of Washington.

Boston's campaign for clean milk, J. O. JORDAN (*Jour. Amer. Med. Assoc., 49 (1907), No. 13, pp. 1082–1087, figs. 2*).—In 1904 the board of health of Boston adopted milk regulations prohibiting the sale of milk having more than 500,000 bacteria per cubic centimeter or a temperature above 50° F. Of the samples examined during 1905, 87.6 per cent conformed to the bacteriological standard, and of those examined during 1906, 89.98 per cent. The percentage of infected samples as indicated by the presence of streptococci or pus was 10.48 per cent in 1905 and 4.9 per cent in 1906. The article gives much data concerning the work done, and shows that a decided improvement of the city milk supply has resulted from the vigorous efforts made by the board of health.

The methods of dealing with the milk supply of New York City, T. DARLINGTON (*Jour. Amer. Med. Assoc., 49 (1907), No. 13, pp. 1079–1082*).—An outline of the methods employed by the board of health in regulating the milk supply of New York City.

The quality of Danish milk sold in Berlin, B. PROSKAUER, E. SELIGMANN, and F. CRONER (*Ztschr. Hyg. u. Infektionskrank., 57 (1907), No. 2, pp. 173–247*).—Chemical and biological examinations were made of 13 samples of winter milk from Denmark and 8 samples of summer milk.

The specific gravity of the summer milk averaged 1.032 and of the winter milk 1.033. The fat content averaged, respectively, 3.04 and 3.20 per cent. The bacterial content of the summer milk was about 5,000,000 per cubic centimeter and of the winter milk about 2,100,000. This was much higher than Berlin market milk. The catalyzing power of the Danish milk was much lower than that of the Berlin milk. Coagulation with alcohol and on heating occurred earlier with Danish than with Berlin milk. On the whole, the Danish milk was superior to Berlin market milk as regards composition, but inferior as regards biological properties.

Dairy department, W. J. ELLIOTT (*Montana Sta. Rpt. 1906, pp. 168–180, figs. 3*).—In experiments with cream kept for various periods up to 4 days before churning it was found that the churnability of the cream was not affected by the lengths of time the cream was kept. There was some difference in melting point between the butter fat from the fresh cream and that from the older cream, but in all cases the melting point was higher 2 weeks after the butter was made than while it was fresh; then it decreased on keeping for 6 or 8 weeks.

As a result of experiments it was found that with the same separator and the same cows the percentage of fat in the cream may vary more or less from day to day in accordance with differences in the following factors: (1) Temperature of milk separated; (2) high or low speed of separator crank, or speed of separator bowl; (3) rate of inflow of milk; (4) milk of varying butter fat content; (5) amount of skim milk or water used to flush the bowl; (6) acidity of the milk separated, and (7) irregular speed of separator.

A study of the bacterial content of cream, L. L. LEWIS and W. R. WRIGHT (*Oklahoma Sta. Bul. 75, pp. 16, charts 13*).—Bacteriological examinations were made of cream as delivered by patrons of the college creamery during July and August, and again during December, January, and February.

The cream delivered in summer at an age of 3.3 days contained on an average 462,600,000 bacteria per cubic centimeter, and that delivered in winter at an age of 5 days contained 134,800,000. The bacterial content was found to increase for the first 3 days in summer and 4 days in winter, after which there was a steady decrease. More than 50 per cent of the cream delivered during the summer months contained an excessive number of gas-producing bacteria. The digesting bacteria were also present in large numbers. The average cream more than 2 days old in summer could not be handled at the creamery with good results. Rich cream contained less acid than this cream.

The practical use of starters, L. D. BUSHNELL and W. R. WRIGHT (*Michigan Sta. Bul. 246, pp. 139–151, figs. 7*).—A practical method of using starters is described in a popular manner in this bulletin.

Quart bottles of milk are plugged with cotton and sterilized by steam. One bottle is inoculated with a pure culture of lactic-acid bacteria, and after a transfer has been made from this on the second day it is used for inoculating a large can of recently pasteurized milk which may be used the next day as a starter.

The advantages of the method are stated by F. O. Foster as follows:

"The method of carrying motner starters in sterilized milk in glass jars has been given a thorough trial in practical work in the college creamery in comparison with the method commonly employed, which is to inoculate a starter each day from the one prepared the preceding day. The new method has the following advantages:

"The starter can be kept pure for a much longer period, thus saving one-half or more of the cost of pure cultures.

"The milk is always ready for inoculation and the mother starter can be transferred each day when in the best condition and kept vigorous.

"In case a starter is not needed every day, the mother starter can be carried along conveniently without the trouble of sterilizing milk.

"After a thorough trial we have adopted the method for our daily use. We find it no great task to sterilize the bottles of milk once or twice a month, and the little extra labor thus occasioned is more than offset by the convenience and sureness of the new method."

Butter making on the farm, G. H. BARR (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 17, pp. 13, figs. 11*).—This is a popular bulletin on farm butter making. The principal suggestions made are summarized in the following statements: (1) Keep good cows, (2) feed them liberally, (3) keep them comfortable and clean when in the stable, (4) skim a rich cream, (5) keep the cream cool, (6) churn at the temperature that will give a flaky granule in the butter, (7) use clean, pure water for washing butter, not more than 3° colder or warmer than the buttermilk, (8) put the butter up in neat, clean, attractive packages, and (9) keep everything in and about the dairy clean and attractive.

Mottled butter, L. MARCAS and C. HUYGE (*Bul. Agr. [Brussels], 23 (1907), No. 7, pp. 486–491*).—Experiments are reported from the results of which the authors conclude that mottles in butter are due to the presence of buttermilk in conjunction with an uneven distribution of salt. In mottled portions of butter the authors found regularly more casein and less salt than in nonmottled portions of the same lot. The mottling is, therefore, considered due to the action of salt on casein.

Regulations prescribed in regard to renovated butter in accordance with the act of Congress approved May 9, 1902 (*U. S. Dept. Agr., Bur. Anim. Indus. Order 147, pp. 8*).—A pamphlet issued jointly by the Secretary of the Treasury and the Secretary of Agriculture, giving 30 regulations under which "renovated" or "process" butter may be manufactured and marketed. These regulations, which became effective August 15, 1907, supersede all previous regulations pertaining to the same subject.

The practice of soft cheese making, C. W. WALKER-TISDALE and T. R. ROBINSON (*London, 1903, pp. IV+51, figs. 9*).—This is a brief popular outline of essential points in the production and handling of milk, the preparation and marketing of cream, and the manufacture of several varieties of soft cheese, including cream, Gervais, Bondon, Coulommier, Cambridge or York, Pont l'Evêque, and Camembert.

Note on rennet and its preparation, O. JENSEN (*Rev. Gén. Lait, 6 (1907), No. 12, pp. 272-281*).—The rennet preparation which has given the best results in the author's experience in Emmenthal cheese making is made by extracting the calves' stomach with dilute lactic acid. The extract is then inoculated with a vigorous culture of lactic-acid organisms and used within 2 or 3 days. Very great importance, in the opinion of the author, should be attached to the preparation of the rennet extract.

Officials, associations, commissions, and educational institutions connected with the dairy interests of the United States for the year 1907 (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 115, pp. 22*).

The preparation of vinegar from Kieffer pears, H. C. GORE (*Jour. Amer. Chem. Soc., 29 (1907), No. 5, pp. 759-764, dgm. 1*).—The juices of Kieffer pears at ordinary market ripeness, according to the author's investigations, "are so low in sugar that it is impossible to produce from them a vinegar of standard strength (4 per cent acetic acid). The juices of very ripe Kieffer pears probably do contain sufficient sugar to produce a standard vinegar, providing methods of fermentation are employed which will give the maximum yield of acetic acid from the sugar present.

"The method of fermentation of the juice into vinegar which will give the maximum of acetic acid consists in the production of the maximum of alcohol from the sugar by dominant fermentation with selected yeasts, followed by the conversion of the alcoholic liquor into vinegar by the quick process of vinegar making.

"The vinegar obtained is of excellent quality. Its composition is similar to that of cider vinegar, save for its high content of solids and content of pentosans."

Chemical methods for utilizing wood, F. P. VEITCH (*U. S. Dept. Agr., Bur. Chem. Circ. 36, pp. 47, figs. 16*).—This bulletin has been prepared to satisfy "the demand for information as to the nature and uses of the chemical compounds manufactured from wood and the processes and equipment used in their production," especially with reference to the disposition of waste material. Attention is given particularly to the destructive distillation of wood, the recovery of turpentine, rosin, and paper pulp, the preparation of alcohols, and the manufacture of acids. An attempt has been made to explain the processes as simply as the subject-matter will permit.

VETERINARY MEDICINE.

Handbook of comparative microscopic anatomy of domesticated animals, W. ELLENBERGER (*Handbuch der Vergleichenden Mikroskopischen Anatomie der Haustiere. Berlin, 1906, vol. 1, pp. VIII+601, figs. 437*).—The present volume is an outgrowth of the work published under the same editorship in 1887, under the title "Histology of Domestic Mammals." The histological anatomy of man has been very thoroughly worked out and presented in convenient form for reference. Reliable descriptions of microscopic anatomy of domestic animals, however, had not been sufficiently available.

The present volume contains an elaborate account of the microscopic anatomy of all domesticated animals from a comparative standpoint. The material is arranged according to the kind of tissues concerned and has been prepared by various specialists. Abundant bibliographical references are given throughout the text.

Results of investigations in the field of general pathology and pathological anatomy, O. LUBARSCH and R. OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere, 11 (1906), pt. 1, pp. XIV+1-1053, pls. 5, figs. 18*).—An extensive summary is given of the recent literature relating to diphtheria, syphilis, pathogenic molds, protozoan diseases of animals, hemolysins, and theories of immunity. A large part of the volume is occupied with a discussion of immunity and protozoan diseases of animals. The literature on the older theories of immunity is given less attention than that relating to the recent theories of immunity as based on opsonins, and bacteriotropins.

Progress in the study of immunity and the specific nature of bacteria since 1870, with particular reference to tubercle bacilli, R. P. VAN CALCAR (*Prog. Bot., 1 (1907), No. 3, pp. 533-644, figs. 20*).—A detailed critical review is given of the literature relating to theories of immunity and the classification of bacteria in connection with a classified bibliography. Particular attention is given to the developmental forms of the tubercle bacillus and other acid-fast bacilli.

Course of instruction in the Kazan veterinary institute (*Uchen. Zap. Kazan. Vet. Inst., 24 (1907), No. 2-3, pp. 77-154*).—A detailed outline is given of the course of instruction offered at the Kazan veterinary institute. The subjects covered by the course include dissection, physiology, histology, stock judging, stock breeding, farm hygiene, feeding of animals, general and special pathology, pharmacology, general and special therapeutics, bacteriology, veterinary surgery, and clinics.

Report of the chief of the cattle bureau, Massachusetts (*Semiann. Rpt. Cattle Bur. Mass., 10 (1906), pp. 215-279*).—During 1906, rabies continued to prevail to an unusual extent. Nearly 600 dogs were killed on account of being infected with the disease, and a number of other animals also became infected through dog bites. Attention is called to the difficulty of regulating this disease satisfactorily on account of the long period of incubation.

Glanders appears to be somewhat on the decrease as compared with the year previous to this report. The work of inspection for glanders is presented in a tabular form.

An account is also given of the work of the cattle bureau in the control and eradication of tuberculosis. The financial statement accompanying the report indicates the amounts paid as indemnity for various diseased animals.

[Veterinary work] (*Oklahoma Sta. Rpt. 1906, pp. 38-41*).—Since 1900, the station has distributed more than 625,000 doses of blackleg vaccine. Brief directions are given for the use of this vaccine.

Canker of pigs is due to a mange mite. The disease may be treated with carbolic acid, iodin, or a solution of tobacco.

Intestinal parasites in hogs may be expelled by the use of a mixture of spigelia and senna, wormseed, cedar apples, areca nut, or turpentine. Two teaspoonsful of turpentine may be given in milk twice daily.

Conditions which render the mucous lining of the digestive tract permeable to bacteria, J. Bassett and H. Carré (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 17, pp. 890, 891*).—The experiments reported in this paper were carried out on 20 dogs, which were given doses of podophyllin in order to cause irritation of the digestive mucosa.

In 18 of the 20 dogs positive identification was made of intestinal bacteria in the blood of the portal vein, in the chyle, or in both. The bacteria were cocci, staphylococci, and streptococci, such as are found in the intestines of normal dogs. It appears, therefore, that any irritation such as is set up by the use of podophyllin is sufficient to render the alimentary tract permeable to ordinary intestinal bacteria.

A preliminary note on neutral red reaction in the infected red cells of protozoal diseases, F. S. H. Baldrey and W. A. Mitchell (*Jour. Trop. Vet. Sci.*, *2* (*1907*), *No. 2, pp. 169–171, pl. 1*).—In the use of neutral red an excellent means has been found for demonstrating protozoa in blood corpuscles after the digestive action set up in such cases has led to the production of an acid cytase. The method may be used successfully both in cases of red blood corpuscles, the substance of which is being digested by parasitic protozoa, and in white blood corpuscles which are digesting enclosed protozoa. Illustrations are given of the results of applying this method in a study of *Piroplasma canis*.

The effect of glycerin upon tuberculous lesions, V. Galtier (*Jour. Méd. Vét. et Zootech.*, *58* (*1907*), *May, pp. 263–266*).—Tuberculous organs, including lungs, livers, spleens, etc., when completely submerged in glycerin for periods of 8 to 18 months become entirely sterile. An immersion of 7 months is usually sufficient to destroy the virulence of tubercle bacilli. The bacilli are gradually attenuated, as shown by inoculation experiments made with them after they had been kept in glycerin for a few days.

Bovine tuberculosis, L. Van Es (*North Dakota Sta. Bul. 77, pp. 379–430, pls. 11*).—A discussion is presented of tuberculosis in its varied relations to animal industry and human health. Particular attention is given to bovine tuberculosis, including its lesions, prevalence, distribution in the body, cause, symptoms, and diagnosis, the tuberculin test, the economic importance of tuberculosis, and the methods of eradication. A brief bibliography of tuberculosis is also given.

Tuberculosis in swine, W. J. Kennedy et al. (*Iowa Sta. Bul. 92, pp. 24, figs. 2*).—The experiments recorded in this bulletin were undertaken for the purpose of determining the effect of feeding pigs skim milk containing tubercle bacilli, as compared with pasteurized skim milk. The pigs used in the experiments numbered 40 and were divided into 4 equal lots. Two lots received pasteurized milk, one on pasture and the other in a dry yard. The other 2 lots received tuberculous milk, one on pasture and the other in a dry yard. All of the pigs which were fed tuberculous milk became infected and also 2 of the pigs which received pasteurized milk.

It appears that tuberculosis is not readily spread among pigs by mere proximity of diseased to healthy animals. The authors conclude that tuberculous milk is almost sure to infect pigs, while milk pasteurized at a temperature of 200° F. is a safe feed. Pigs confined in clean dry yards are apparently no more susceptible to tuberculosis than those which are kept at pasture.

Tuberculosis in swine, L. E. CARTER (*Iowa Sta. Bul. 92, popular ed., pp. 11*).—A popular edition of the above.

The use of Röntgen rays in the inspection of tuberculous meat, H. MARTE (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 23, pp. 1298–1300*).—The tuberculous lesions of pork and beef commonly contain deposits of lime salts. It was suggested to the author to test the possible value of X-rays in the identification of tubercles, particularly in lymphatic glands so situated that their examination by the ordinary methods would necessitate so cutting the meat as to depreciate its market value. It was found that the shadows obtained from the use of X-rays were very different in the case of tuberculous glands from those of glands surrounded by large quantities of fat. While dense masses of fat produce a shadow, the shadow is uniform rather than granular, as is the case when lime salts are deposited.

Anthrax, W. C. PATRICK (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 5, pp. 279–285.*)—The symptoms and post-mortem lesions of this disease are briefly described. Attention is called to its prevalence in the various parts of Great Britain and to its occurrence in man. It is suggested that on account of the imperfect system of meat inspection in England, except in large cities, it is possible for the meat of the animals affected with anthrax to be offered for sale in public markets.

The filterability of hog cholera bacilli, L. F. D. E. LOURENS (*Centbl. Bakt. [etc.], 1. Abt., Orig., 44 (1907), Nos. 5, pp. 420–427; 6, pp. 504–512; 7, pp. 630–648, figs. 5*).—An elaborate review is given of the results obtained by different investigators in the study of the biology and pathogenic properties of the hog cholera bacillus. Recently an unusual interest has been added to this study by reason of the discovery by the Bureau of Animal Industry of this Department that hog cholera may be produced by inoculating susceptible animals with filtrates from infected organs and from pure cultures of the hog cholera bacillus. These results have been confirmed by a number of investigators in other countries. In fact in South Africa, A. Theiler was unable to find the hog cholera bacillus in the form of the disease which prevails in that country.

At the beginning of his investigations the author suspected that aggressins might be present in the filtrates from infected organs and cultures of hog cholera bacilli, which render the animals so susceptible to the disease that the slightest infection with the hog cholera bacillus would produce the symptoms of the disease, while without the influence of aggressins no infection would have taken place. To this end material obtained from the organs of hogs affected with chronic or acute hog cholera was passed through various filters including the Chamberland, Berkefeld, and Kitasato forms. In inoculation experiments with this material the results were sometimes positive and sometimes negative. Further experiments were then carried on to determine whether the hog cholera bacilli could themselves pass through the filters. It was found that hog cholera could be produced in hogs as a result of inoculation with filtrates which were apparently free from bacteria at the time of inoculation and that subsequently hog cholera bacilli appeared in these animals.

A number of other experiments were carried on with filtrates from pure cultures of hog cholera bacilli and positive infections were produced. In the author's opinion the hog cholera bacillus may pass through the Chamberland, Berkefeld, or Pukall filter. The extent to which such passage through filters takes place depends largely upon the treatment of the filters and the fluid in which the filtrate is diluted.

The explanation of the passage of hog cholera bacilli through filters previously shown to be too fine for the passage of bacteria of normal size is believed to be found in the granulation of these bacilli, as repeatedly observed by the author. The bacilli appear to exist at times in the form of granules, which may be regarded as the resting stage of the bacillus. These granules appear like cocci, and the single bacillus may become divided into as many as three of them. The granules are highly refractile and appear at first at either end of the bacillus, where they might be mistaken for spores. It is apparent, therefore, that the extent to which bacilli pass through filters depends largely on the degree of granular disintegration of the bacilli. In a too highly diluted serum they failed to pass through the filters.

A similar granulation and passage through filters was observed in the case of *Staphylococcus aureus*, *S. albus*, the typhoid bacillus, blackleg bacillus, and *Bacillus enteritidis*.

As a result of these experiments, the author comes to the following conclusions: The hog cholera bacillus under certain conditions may pass through unvitrified porcelain filters. Its power of passing through filters depends upon its property of dividing up into granules, which in turn is considered as a natural peculiarity of the hog cholera bacillus. In all cases of true hog cholera, *Bacillus suipestifer* may be demonstrated, and this is considered as the only cause of the disease.

The nature of Spirochæta, G. MAROTEL (*Jour. Méd. Vét. et Zootech., 58 (1907), May, pp. 294–306, figs. 4*).—A list is given of the species of Spirochæta which are known to produce disease in man, chickens, dogs, cattle, sheep, horses, etc. At first no doubt was entertained that these organisms belonged with the bacteria. Later, evidence was presented in favor of grouping them with the protozoa. The facts for and against such a classification are presented by the author, who comes to the conclusion that the affinities of Spirochæta have not been definitely determined, but in the case of most species the evidence is rather in favor of their being bacteria.

Immunity in spirochæte septicemia of fowls and the question of the classification of Spirochæta with protozoa, F. NEUFELD and VON PROWAZEK (*Arb. K. Gsndhtsamt., 25 (1907), No. 2, pp. 494–504, fig. 1*).—The serum of fowls which have recovered from septicemia due to infection with Spirochæta possesses, in vitro at least, a very strong immunizing effect, but this power varies to a striking extent. The authors' study of the Spirochæta found in cases of fowl septicemia has led them to the opinion that these organisms are more closely related to the protozoa than to bacteria.

The treatment of tsetse-fly disease with brilliant-green, WENDELSTADT (*Sitzber. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, 1906, I, pt. B, pp. 4–7*).—Previous experiments in the use of trypanrot and other substances for the destruction of the trypanosomes of tsetse-fly disease have shown that these organisms may temporarily disappear in the blood as the result of curative injections, but that they subsequently reappear. Similar results were had with brilliant-green. The trypanosomes, even in bad cases of infection in rats, entirely disappeared within 24 to 36 hours after a subcutaneous injection of 1 cc. of an aqueous solution of brilliant-green, but within a few days, however, they reappeared. It was found that subsequent injections would cause them to disappear again, but it is not safe to repeat the injections of brilliant-green indefinitely for the reason that it causes necrosis of the tissues. In 1 rat and also in 1 ape a complete cure was brought about.

Transmission of yaws by ticks, E. E. MODDER (*Jour. Trop. Med. and Hyg. [London], 10 (1907), No. 11, p. 187*).—A disease known as yaws has been observed by the author in fowls, cattle, and man. Some evidence is presented in favor of the belief that the disease is transmitted by ticks belonging to the species *Ixodes bovis*.

The action of tetanus bacilli and their toxins upon the alimentary tract, M. RABINOWITCH (*Arch. Hyg., 61 (1907), No. 2, pp. 103–150*).—In experiments with laboratory animals it is found that the gastric juice under normal conditions destroys the virulence of tetanus bacilli and tetanus toxin, the latter being affected more promptly. This action of the gastric juice is more efficient the higher its content of common salt. A 1 per cent solution of normal hydrochloric acid will destroy the virulence of tetanus bacilli within 2 hours at a temperature of 37° C.

When tetanus bacilli are fed to rabbits and guinea pigs in large doses they do not produce symptoms of tetanus, but the animals may be affected by a progressive marasmus which sometimes terminates fatally. In rabbits the introduction of tetanus toxin into the stomach sometimes causes peculiar cerebral symptoms. The presence of tetanus bacilli and tetanus toxin in the stomach of animals may, therefore, be dangerous or even fatal, notwithstanding the fact that the gastric juice exercises a vigorous action upon them.

Infectious granular vaginitis of cattle; its treatment and prophylaxis, H. RAEBIGER (*Rev. Gén. Méd. Vét., 9 (1907), No. 107, pp. 625–635; 108, pp. 689–697*).—The continued prevalence of infectious granular vaginitis has rendered necessary certain quarantine and therapeutic regulations in order to control the disease. It is recommended that no cow be introduced into a herd without first subjecting her to a veterinary inspection for the possible presence of the disease. In order to insure the further safety in herds where an outbreak of the disease has occurred, it is recommended that all bulls and cows should receive proper antiseptic treatment.

Vaccination against rinderpest by the combination method in 1906, V. TVARYANOVICH (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 3, pp. 211–225*).—During the maintenance of quarantine for rinderpest, vaccination experiments were made on a number of bulls, cows, and calves, using the combination method of serum and virulent blood. The results obtained were very satisfactory. It appeared that the method not only has a vaccinating effect, but also exercises a curative effect in a certain percentage of cases.

Ticks and tick fever conference (*Queensland Agr. Jour., 18 (1907), No. 6, pp. 281–320*).—A conference was held in Brisbane on May 7, 1907, at which many representatives of scientific and agricultural organizations were present for the purpose of discussing the status of Texas fever and the means for combating it. It appears that the history of the disease in Queensland has been very similar to that of its progress in the United States.

The dip recommended for freeing cattle of ticks contains 8 lbs. of arsenic, 4 lbs. of caustic soda, 1 gal. of Stockholm tar, and 8 lbs. of tallow in 400 gals. of water. Various modifications of this dip have also been tested. The problems connected with the prevalence of Texas fever in Queensland are discussed from various standpoints by C. J. Pound, R. S. Archer, C. J. Booker, S. Kelly, and others. A resolution was adopted recommending compulsory dipping of cattle in all tick-infested districts. It was also urged that a government subsidy be granted to private dipping plants provided these are open to the public.

A note on a new species of trypanosoma discovered in the blood of an Indian bullock at Singapore, P. S. FALSHAW and A. LINGARD (*Jour. Trop. Vet. Sci., 2 (1907), No. 2, pp. 217–220, pl. 1*).—A zebu affected with a chronic disease accompanied with fever was examined by the authors after the animal had died from the disease. The blood obtained from the diseased animal was inoculated into dogs without obtaining any infection. An examination of the blood showed the presence of a very large trypanosome, parasites of Texas fever, and a number of other protozoan organisms. A description is given of the large species of trypanosome found, but no descriptive name is used.

Strongylus contortus and blue tongue, A. Grist (*Orange River Colony, Dept. Agr., Vet. Div. Leaflet 4, pp. 17*).—The life history of *Strongylus contortus* is briefly outlined. In combating this pest attention should be given to the quality of the drinking water and the condition of pastures. Some benefit is derived from the administration of a solution of copper sulphate or arsenic to infested sheep.

Blue tongue of sheep appears to be a catarrhal fever which affects the mucous membrane of the mouth and other parts of the alimentary tract. The period of incubation is 2 to 5 days. An attempt is being made to produce a vaccine for the prevention of blue tongue.

Infectious inflammation of the spinal cord, or azoturia, M. Schlegel (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 6, pp. 459–545, pls. 3*).—In a long continued study of various cases of disease in horses, known as inflammation of the spinal cord, meningo-myelitis, infectious paralysis, hemoglobinemia, hemoglobinuria, azoturia, and black ischuria, the author has accumulated conclusive evidence that these are merely names of one and the same disease, which is of an infectious nature, due to *Streptococcus melanogenes*, discovered by the author in 1906. This organism occurs as a regular saprophyte in the intestines of healthy horses and often in cases of diseases. Under especially favorable conditions it may become highly virulent, gain entrance to the blood, and produce the symptoms which are characteristic of infectious spinal paralysis or azoturia.

The pathological lesions which are noted in cases of this disease include a black tarry condition of the blood which does not coagulate regularly, pronounced disintegration of the blood corpuscles, transformation of the hemoglobin into melanin, and also various alterations in the structure and composition of the liver, kidneys, bones, and other tissues.

The pathogenic organism of the disease has been isolated and studied from pure cultures in various nutrient media.

In combating this disease according to the new conceptions furnished by the author's investigations, it is desirable to isolate affected horses and to disinfect all excretions, since the organism of the disease may be carried in them.

Recovery from glanders, Mouilleron (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 10, pp. 223–230*).—The repeated application of the mallein test to a glandered horse gave a gradually diminishing reaction, and during the last 4 years of his life no reaction took place. The horse was under continuous observation for 8 years. At the end of this time the animal was killed and carefully examined. All organs were perfectly healthy and entirely or nearly without the evidence of previous lesions.

The etiology of pneumonia, Lorenz (*Berlin. Tierärztl. Wchnschr., 1907, Nos. 23, pp. 447–450; 24, pp. 471–474, pls. 2*).—In a study of the micro-organisms found in cases of this disease the author finds undoubted evidence of transformation stages from streptococci to branched threads of streptothrix, and under certain conditions a retransformation of these threads into streptococci. The streptothrix threads with numerous branchings appear most regularly when the original streptococci are inoculated into pure cultures of Aspergillus. When these cultures in turn are inoculated into ordinary nutrient media, the streptococci reappear. The author considers that the appearance of branched threads of streptothrix in the lungs and skin of horses affected with the disease is undoubted evidence of the causal connection of this organism with pneumonia.

Preliminary note on a parasite found in connection with "the irritable summer skin disease" of horses in India, V. B. Nesfield (*Jour. Trop. Vet. Sci., 2 (1907), No. 2, pp. 172–176, fig. 1*).—In various parts of India a quite serious skin disease of horses has been observed which is confined strictly to horses of Australian origin. The disease occurs only in hot and rainy weather and disappears entirely in cold weather. The hair breaks off leaving bald scaly patches somewhat like those which occur in ringworm. An examination of the hair on diseased areas revealed the presence of large numbers of minute highly refractive bodies in the substance of the hair. These bodies resist the solvent action of hot caustic potash and stain readily with basic anilin dyes.

The nervous form of distemper in dogs, Ohler (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 21, pp. 401–404*).—For many years text-books have contained descriptions of the symptoms of nervous distemper in dogs in which nervousness appears in advance of any other lesions or symptoms which characterize distemper. According to the author's investigations the term nervous distemper is perhaps a misnomer. In no instance was he able to observe any nervous condition in advance of other symptoms of distemper and connected with this disease. In all cases in which pronounced nervousness, comparable with the symptoms so described for nervous distemper, occurred, it was more easily explained as due to other causes.

The diagnosis of rabies from the standpoint of veterinary police work, Lübke (*Berlin. Tierärztl. Wchnschr., 1907, No. 21, pp. 415–420*).—Statistics are given regarding the prevalence of rabies in various parts of Europe with particular reference to some of the more serious outbreaks of the disease. Even during the progress of these serious outbreaks, but particularly at times when the disease occurs only sporadically, there are many individuals who doubt the existence of the so-called dumb form of the disease and, therefore, give protection to affected dogs which are largely responsible for the spread of the disease. A number of instances are mentioned in which such dogs have occasioned the wide distribution of rabies.

Negri corpuscles and their relation to rabies, V. Babes (*Ztschr. Hyg. u. Infektionskrank., 56 (1907), No. 3, pp. 435–452, pls. 2*).—On the basis of his experiments with rabies the author comes to the conclusion that certain minute corpuscles, which appear in cases of rabies and which may be stained black or blue by the method of Cajal-Giemsa and are exclusively found in the cytoplasm of disintegrated nerve cells, are the parasitic organisms of rabies in an active condition. Negri corpuscles, on the other hand, are not always present and are evidently not closely enough associated with the progress of rabies to be considered the active cause of the disease. They appear to be encapsulated forms of the rabies organism in a process of involution or transformation. Possibly they are the result of an intense local reaction of the tissues against the presence of the rabies parasites.

Negri corpuscles in the salivary glands of rabid dogs, Elise Stefanescu (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 17, pp. 886–888*).—A considerable number of investigators have already demonstrated the presence of Negri bodies in different parts of the nervous system. On account of the extreme virulence of the saliva of rabid animals the author made a study of the salivary glands in order to determine whether Negri corpuscles occurred in these structures. Negri bodies were found in the parotid glands. In demonstrating these bodies the author fixed small pieces of tissue in formaldehyde and sectioned them upon the freezing microtome.

Spontaneous recovery of dogs from rabies and the persistence of the virus in the saliva, P. Remlinger (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 10, pp. 269–275*).—It has long been known that rabid dogs and other animals may recover from the disease. It has been believed, however, that the virus is not virulent after recovery. The author cites a case in which the virus was extremely virulent for some time after recovery from the disease.

Antirabies serum, P. Remlinger (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 18, pp. 961–963*).—The activity of serum is not proportional to the quantity of virus injected into the animal used for the production of the serum. In one instance a sheep which had received hypodermically 130 rabbit brains furnished a less active serum than another sheep which had received only 81. Quite often rapid and unexplained changes take place in the activity of the serum of animals used for experimental purposes. This matter has not yet received satisfactory explanation.

Leukemia of the common fowl, A. S. Warthin (*Jour. Infect. Diseases, 4 (1907), No. 3, pp. 369–381, pl. 1, figs. 8*).—Brief mention is made of the cases which have previously been reported of leukemia in domesticated animals. The outbreak studied by Moore (E. S. R., 9, p. 890) and referred to under the name infectious leukemia is believed by the author not to be leukemia but a leucocytosis due to some bacterial infection.

The author has had opportunity to study two forms of lymphocytoma which are referred to as aleukemic and leukemic. In the aleukemic form of lymphocytoma no increase in the number of white cells is observed in the blood vessels. In the leukemic form of the disease the ratio of the red cells to the white in the blood may be less than 2 : 1 and a differential count of the white cells shows that on an average 84.5 per cent are large lymphocytes. In normal hens' blood the proportion of red blood corpuscles to white is 105–225 : 1 and only 14 per cent of the white cells are large lymphocytes. The tissue changes which occur in leukemic lymphocytoma consist in tumorous nodules and infiltration of lymphoid cells in liver, spleen, bone marrow, and other organs. The normal white cells of the blood are replaced by large lymphocytes and a secondary degeneration of the organs takes place.

The action of atoxyl on spirillosis of fowls, C. Levaditi and J. McIntosh (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 21, pp. 1090–1092*).—When atoxyl is mixed with the virus of spirillosis in vitro, it does not exercise a very pronounced effect upon the virus. In living fowls, however, atoxyl causes regressive alterations in the spirilla of the disease. The specific effect of atoxyl seems to be an exaggeration of the means normally employed by the organism in self-defense.

Immunization against fowl cholera with bacterial extracts, E. Weil (*Ztschr. Hyg. u. Infektionskrank., 56 (1907), No. 3, pp. 509–515*).—This article is largely of a controversial nature. The author maintains that the action of aggressins and bacterial extracts are by no means the same in the case of fowl cholera.

The value of gaseous disinfectants, L. L. Lewis and Maude English (*Oklahoma Sta. Circ. 6, pp. 8*).—Experiments were made to determine the disinfectant power of sulphur dioxid, vaporized carbolic acid, and formaldehyde gas toward anthrax spores, *Staphylococcus pyogenes aureus*, typhoid bacilli, glanders bacilli, *Bacillus bovisepticus*, etc.

Sulphur fumes have the disadvantage of decolorizing fabrics and attacking metals. They can not be depended upon to disinfect in a dry atmosphere. In a moist atmosphere 5 lbs. of sulphur burned in 1,000 cu. ft. of space will kill anthrax bacilli if allowed to act for 4 hours.

Anthrax spores were not killed by exposure for 6 hours to the fumes of carbolic acid (625 cc. being vaporized in 1,000 cu. ft. of space).

Formaldehyde does not injure fabrics or metals and is most effective. Under ordinary conditions 240 cc. per 1,000 cu. ft. of space will give good results. Notes are given on the use of formaldehyde candles and generators. Formaldehyde does not penetrate fabrics very vigorously. The room should show a temperature of about 98° F. and a moisture content of 90 per cent.

The disinfection of skins infected with anthrax, Xylander (*Arb. K. Gsndhtsamt., 25 (1907), No. 2, pp. 457–477*).—In the practical destruction of anthrax spores on skins in tanneries it is considered necessary that they be treated with formaldehyde for from 6 to 14 days by the addition of 0.5 to 1 per cent of formaldehyde to the liquid in which the skins are kept. This strength of formaldehyde will destroy the anthrax spores, but unfortunately it injures the skins to such an extent that they are not suitable for commercial use thereafter. Formaldehyde is, therefore, not a practical disinfectant for use in this connection. Similarly in using corrosive sublimate, lysol, lysoform, and cresols the objection is found that poisonous effects are experienced by workmen who handle skins treated in this manner, and also that the leather is somewhat injured. The experiments thus far carried on have not led to a practical method for the disinfection of skins.

RURAL ENGINEERING.

Irrigation, J. J. VERNON (*New Mexico Sta. Rpt. 1906, pp. 29–38*).—This report covers the irrigation experiments made at the New Mexico Station in cooperation with this Office during 1905. The experiments included a comparison of cost and results in irrigating with river water and with water pumped from wells. With alfalfa the yields were slightly larger where river water was used, although the cost of producing the alfalfa was but 62 cts. per ton with river water and $4.46 per ton with pumped water. On the other hand, the yield of tomatoes irrigated with well water was three times as large as that from plants irrigated with river water, while the expense was but 50 per cent larger.

Evaporation records were kept, the total evaporation for the year being 58 in., estimating the evaporation for two weeks in July not covered by the records.

Tests were made of four pumping plants, one using a steam engine and three with gasoline engines, in two of which naphtha was used for fuel instead of gasoline. Efficiencies of the engines were remarkably uniform, varying from 71 to 78.54 per cent. The efficiencies for the entire plants are not given. The fuel cost per foot-acre-foot with the steam engine with coal at $5 per ton was 6.89 cts., with gasoline at 19.5 cts., 7.27 cts., and with naphtha at 13.5 cts., 5 cts. for one of the plants, and 17 cts. for the other.

Irrigation investigations, E. NELSON (*Idaho Sta. Bul. 58, pp. 46, figs. 2*).—This bulletin gives the results of irrigation investigations carried on in 1906 in cooperation with this Office. The work was confined to the Twin Falls tract in south central Idaho on the Snake River and included soil-moisture determinations before and after irrigating, in connection with observations on the conditions of the crops to determine the water-holding capacity of the soil, the degree of wetness most conducive to plant growth, and the amount of water which can be applied at a single irrigation without waste.

It was found that the maximum water capacity of the Twin Falls soils was 24.72 per cent by weight and 43.69 per cent by volume, or sufficient to cover the land to a depth of 5.24 in. for each foot of soil. The unbroken soil was found to be moist at a depth of only 18 in. and contained 5.78 in. of water in the first 3 ft. Land irrigated the preceding season contained in the spring 10 in. of water in the first 3 ft. It was found that irrigated land can hold by capillarity 10 in. of water in 3 ft. The average quantity of water used on first-year land was 21.88 in. and on the second-year land 17.84 in., the average amount applied in a single irrigation being 7.84 in.

The furrow system of irrigation is used on 90 per cent of the land in the Twin Falls tract, the furrows being made 20 to 24 in. apart. The cost of clearing land and preparing it for irrigation and for seeding is given as $10.50 per acre. The average yields per acre reported are: Wheat, 45 bu.; oats, 80 bu.; potatoes, 250 bu.; corn, 30 bu.; alfalfa, first year, 1 ton; second year, 6 tons, Seepage measurements were made on the main canal and several of the laterals, the results in average percentage of loss per mile being as follows: Main canal, 1.17 per cent; low line, 1.95 per cent; high line, 1.41 per cent; main laterals, 3.29 per cent; coolies, 0.9 per cent. The natural channels therefore show the smallest loss, and the percentage of loss in the artificial channels increases as the volume of water decreases.

Weir experiments, coefficients, and formulas, R. E. HORTON (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 200, pp. 195, pls. 38, figs. 17*).—This is a revision of Paper No. 150 of the same series, the change consisting in the addition of tables giving the discharge over thin-edge weirs by Bazin's formula, and tables giving multipliers for the determination of the discharge over broad-crested weirs, all prepared by E. C. Murphy.

Report on the drainage of the eastern parts of Cass, Traill, Grand Forks, Walsh, and Pembina counties, North Dakota, J. T. STEWART (*U. S. Dept. Agr., Office Expt. Stas. Bul. 189, pp. 71, pls. 6, figs. 2*).—The surveys reported in this bulletin dealt with lands which represent an area of about 3,000,000 acres in the valley of the Red River of the North, which has so little fall that in many years the soil is too wet for crop production.

The surveys were made for the purpose of determining the feasibility of draining the valley, the location and size of drains necessary, and the cost of their construction. The work was done by this Office in cooperation with the State of North Dakota, the counties in which the surveys were made, and the Great Northern Railway Company.

The report deals with the general topographical and climatic conditions and characteristics of streams tributary to Red River, the size, form, and silting of ditches, the erosion of channels, the effect of straightening natural drainage channels, and estimates and recommendations in general and in detail for each separate county represented. It is shown that faulty drainage can, in great measure, be overcome by increasing the efficiency of existing natural water courses, by straightening the channels, removing obstructions, and building levees at low points.

"Where banks of streams are higher than the land a short distance away from them, as is true of nearly all of the streams in the valley, they act as natural levees to hold the streams within their channels and should not be cut to furnish an outlet for a drainage ditch unless it is impossible to secure such outlet in any other way. There are usually coulées and natural channels running parallel to the streams, back of the bank ridge, which finally enter the main stream, into which ditches may be discharged. Wherever it is possible all ditches should enter the streams through these natural channels. It would greatly facilitate drainage movements in the area surveyed if tributary streams were declared drainage channels and placed under the supervision of drainage authorities."

Examination and classification of rocks for road building, including the physical properties of rocks with reference to their mineral composition and structure, E. C. E. LORD (*U. S. Dept. Agr., Office Pub. Roads Bul. 31, pp. 29, pls. 10, fig. 1*).—This bulletin describes in some detail the more important quantitative methods of microscopic rock analysis used in the Office of Public Roads, and reports the results of such examinations, proposes a classification of road material suited to the requirements of road builders and engineers, and discusses the relation of the physical properties of rocks to their mineral composition and structure.

The road-making rocks examined are graded into classes, types, families, and subfamilies or varieties, and the various distinguishing features of each group explained at length.

In the application of the results of these tests to the correlation of the physical properties of the rock families with their mineral components the following conclusions have been reached:

"(1) Igneous and metamorphic rocks, owing to a higher degree of crystallization and a preponderance of silicate minerals, offer a greater resistance to abrasion than nearly all varieties of sedimentary rocks.

"(2) The coarse-grained intrusive rocks of the igneous class are harder, but break more readily under impact than the finer-grained volcanic varieties of like mineral composition.

"(3) The deleterious effect of atmospheric weathering on the wearing qualities of rocks has been demonstrated.

"(4) The cementing value of rocks is, to a certain degree, measured by the abundance of secondary minerals resulting from rock decay.

"(5) Metamorphic rocks have, as a rule, a low binding power, owing to a regeneration of secondary minerals and to the effects of heat and pressure. The foliated types part readily along planes of schistosity, and therefore are not well adapted to road construction.

"(6) The quantitative mineral analysis of rocks serves to a certain extent as a measure of their useful properties for road construction."

The construction of macadam roads, A. B. FLETCHER (*U. S. Dept. Agr., Office Pub. Roads Bul. 29, pp. 56, pls. 6, figs. 10*).—This bulletin describes in some detail the best practice in macadam road construction, and especially that followed by the Massachusetts highway commission.

"It is intended as a brief description and discussion of the several processes and essential features entering into the construction of macadam roads in rural sections. Some data as to costs, especially for the information of road officials who have not undertaken such work, are included.

"The details of construction may require modification to some extent to be suitable for different parts of the country, depending upon amount of rainfall, temperature, and topography, but the general type of road to which this bulletin relates is adaptable to nearly all parts of the United States where suitable stone exists or to which such stone may be carried without excessive cost."

Corn-harvesting machinery, C. J. ZINTHEO (*U. S. Dept. Agr., Farmers' Bul. 303, pp. 32, figs. 20*).—This is a condensation of Bulletin 173 of this Office (E. S. R., 18, p. 785).

Farm buildings, (*Chicago, 1907, rev. ed., pp. 310, pl. 1, figs. 515*).—This is a new and thoroughly revised edition of this book, and consists of "a compilation of plans for general farm barns, cattle barns, dairy barns, horse barns, sheep folds, swine pens, poultry houses, silos, feeding racks, sheds, farm gates, portable fences, etc., all representing construction in actual use."

Ventilation, heating, and lighting, W. H. MAXWELL (*London, 1907, 2. ed., rev. and enl., pp. VI+151; rev. in Nature [London], 76 (1907), No. 1968, p. 268*).—"The simple principles and practice of ventilation, heating, and lighting are described in this volume from the point of view of the sanitary engineer."

RURAL ECONOMICS.

West Virginia agriculture and its possibilities, J. B. GARVIN ET AL. (*Rpt. W. Va. Bd. Agr., 1907, No. 6, pp. 48, figs. 18, maps 4*).—As a means of furnishing information to prospective agricultural settlers, this bulletin describes the topography of the State, including descriptions of its natural and mineral resources, the origin and distribution of its soils, and the crops grown thereon. The live-stock industry of the State is also described.

It is claimed that there are 5,155,532 acres of virgin land, or about 30 per cent of the total area of the State, which are capable of being brought under cultivation. The railroads and industries are said to be drawing the population from the land into the towns and cities by their demand for labor. "Young and middle-aged men have been attracted thither by the inducement of better wages than the farm, managed after the old way, could provide. In some cases the old folks are left to care for the farm as best they can, and such farms as well as virgin lands could be bought for a reasonable sum. With energy and a little capital these lands could be made to produce a comfortable living, provide a home free from the cares and anxieties experienced in the strenuous life in the city." This movement toward the cities centralizes a large nonproducing population which must buy their food supplies, and to meet this demand affords abundant opportunity for the development of agriculture throughout the State.

Agriculture and agricultural services [in Jamaica], J. A. SWETTENHAM (*Colon. Rpts., Ann. [Gt. Brit.], No. 524, pp. 8–23*).—The agricultural conditions of Jamaica in 1905–6 are described, and statistics relating to the exports and imports of products are reported and compared with similar data for preceding years.

There has been a steady improvement in the general agricultural conditions of the colony during the year. The wages of farm laborers range from 1s. to 1s. 6d. per day. The agricultural society reports 498 members in the central organization and 50 branch societies with 2,580 members. Its objects are "to obtain useful information and to disseminate it, to encourage improved cultivation of products and improved breed of stock, and to watch over the agricultural industry generally."

Irish migratory agricultural laborers, 1906, W. G. S. ADAMS (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis., 1906, pp. 42*).—This is a report on the number of agricultural laborers migrating for work to England and Scotland in 1906, the parts of Ireland from which drawn, the number and classes of landholders among the emigrants, their distribution, conditions of work and living, earnings and savings in England and Scotland, etc.

The returns show the number of migrants in 1906 to have been about 25,000, of whom 1,000 were women. Three-fourths are natives of the Province of Connaught, and half the number are from the county of Mayo alone. As regards landholding, definite returns by the constabulary show that of 15,286 migratory laborers in 1906, 11,914 did not hold any land, 497 had holdings not exceeding 5 acres, while 2,875 had holdings of over 5 acres. The quantity of land held, therefore, was in most instances not sufficient to provide a living without other source of income. The chief work of the emigrants was as potato growers and harvesters, while wages ranged "from a lower limit of 15s. a week, with lodging and some food, to piece-work earnings, which at the busy season in several districts reach 30s., and in some cases even £2 a week." It is estimated that the agricultural migratory laborers remitted or brought back to Ireland in 1906 savings amounting approximately to £275,000.

The scarcity of farm help, HEINRICHSEN (*Fühling's Landw. Ztg., 56 (1907), No. 13, pp. 470–475*).—The author calls attention to the depopulation of rural districts in Bavaria, and assigns as causes of this movement the higher wages received by laborers and servant girls in cities and the freer life and easier or more congenial employment to be found there.

Among the remedies suggested to bring about the return of the people to the land may be mentioned the application of industrial methods to agriculture, especially in the use of improved implements and machinery, better food and shelter for laborers, the erection of small houses for the use of laborers' families, the granting of small holdings, and the creation of a class of peasant proprietors.

The comparative costs of the cultivation of land by power machinery and animals, W. CLAASSEN (*Deut. Landw. Presse, 34 (1907), No. 63, pp. 511, 512*).—The author compares the cost of plowing and cultivating different kinds of lands by means of steam and other power machinery with the cost of cultivating land with horses or oxen. The cost of power machinery for the small farmer is regarded as prohibitive, but where the character of the land permits and a steam plow can be procured through cooperative societies it is believed to be of unquestionable advantage. Team plowing and cultivation, however, rather than working with a single animal, are believed to be best for the average farmer.

Agricultural cooperation in Belgium (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 5, pp. 573-585*).—The data presented in this article were furnished by the different cooperative societies to the minister of agriculture in 1906, and are grouped under 5 general divisions.

The returns at the close of 1905 show 814 agricultural federations, composed of those who are engaged in one particular industry, as hop raising, beet culture, the production of goats, horses, dairy cows, pigs, etc. In addition there were 907 societies with 53,016 members for the cooperative purchase of seeds, fertilizers, feeding stuffs, and machinery, 552 cooperative dairies with 55,118 members controlling the products of 146,674 cows, and 960 live stock insurance societies with 84,983 members insuring 249,273 head of stock. Statistics are also given on the progress of the agricultural banks and credit societies, including their number, loans, deposits, forms of security, number and classes of borrowers, etc.

Agricultural credit in Sicily and its application according to law, C. GRIMALDI (*Bol. Quind. Soc. Agr. Ital., 12 (1907), No. 12-13, pp. 474-494*).—A brief sketch is given of the laws relating to agricultural credit in Sicily, and the different credit societies formed under the laws with the means of giving and securing credit to different classes of peasants are discussed.

Agricultural exchanges, F. NICOLLE (*Jour. Agr. Prat., n. ser., 13 (1907), No. 24, pp. 749-752*).—The author advocates the organization of cooperative agricultural exchanges in France for the sale particularly of cereal products in order to bring larger returns to producers by eliminating in great measure the profits of middlemen. He believes that the cooperative associations now in active operation are the proper means to this end.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 9 (1907), No. 10, pp. 73-80*).—Statistics on the condition, acreage, yields, and prices of agricultural products in the United States and foreign countries are summarized and discussed.

Official report on the condition of crops, also tables of agricultural statistics for 1905 and 1906 (*Ohio Dept. Agr., Div. Crops and Stock Statis. Rpt., 1907, pp. 44*).—The condition of crops on August 1, 1907, and statistical data for 2 years collected by county auditors and reported to the State secretary of agriculture are reported.

Preliminary returns of the agricultural census of Austria from June 3, 1902, F. R. VON JURASCHEK and W. SCHIFF (*Österr. Statis., 83 (1907), Sup., pp. 45*).—Tabulated data on the acreage devoted to different forms of agricultural production, yields of crops, number of live stock, use of machinery, number of persons of both sexes engaged in agriculture, etc., are reported.

Report on the profitableness of agriculture in Switzerland during 1905 (*Ann. Agr. Suisse, 8 (1907), No. 2, pp. 13-112*).—In addition to reviewing the agricultural conditions of Switzerland for 1905, a detailed report is presented of the receipts and expenditures from different-size farms. The receipts from 206 farms averaging 13.35 hectares in size were at the rate of 477.85 francs per hectare, while the average expenses per hectare were for labor

286.05 francs and miscellaneous 141.55, a total of 428.20 francs. The calculated average profit, therefore, amounted to 49.65 francs per hectare. The results of the investigations are tabulated and discussed in detail.

AGRICULTURAL EDUCATION.

Country life education, A. C. True (*Ann. Rpts. Bd. Agr. Del., n. ser., 5–6 (1905–6), pp. 41–50*).—An address, followed by a discussion, made before the agricultural conference held at Dover, Del., December 18 and 19, 1906, in which a brief outline is given of a system of agricultural education beginning with the common school and going up to the high school and into the college, with the experiment station back of these to obtain the new knowledge that is needed. In the opinion of the speaker public education should be supported primarily by the State, but local communities should be taxed sufficiently to maintain an acitve interest in educational matters.

Agricultural education in Delaware, H. Hayward (*Ann. Rpts. Bd. Agr. Del., n. ser., 5–6 (1905–6), pp. 50–61*).—This paper, read at the agricultural conference noted above, discusses briefly the advantages of agricultural education, how agricultural education takes the drudgery out of farm life, competition in agriculture, agricultural conditions to-day, what is to be done in Delaware in the way of education and experimentation as shown by a careful study of what is being done in other States, what Delaware has done for her agricultural interests, the farmers' institute, the equipment of the agricultural department of Delaware College as compared with that of the department of mechanic arts, the needs of the agricultural department of the college and station, and particularly the need of a farm.

Report of the committee on children's gardens for the year 1906, H. S. Adams (*Trans. Mass. Hort. Soc., 1906, II, pp. 176–216, pls. 7*).—This report contains brief accounts of the Children's Garden Conference held December 15, 1906, in Boston; school garden, school grounds, and children's home garden competitions; children's exhibitions; and abstracts of addresses made at the conference, as follows: The Educational Value of School Gardens, by H. G. Martin, Boston; Horticultural Education for School Garden Teachers, F. A. Waugh, Amherst; School Garden Work and the Normal School, W. A. Baldwin, Hyannis; Children's Gardens and the Public, F. M. Marsh, Fairhaven; and The School Farm at De Witt Clinton Park, H. G. Parsons, New York City. Reports are given on the South End industrial school garden, Roxbury; Orphans' Home garden, New Bedford; South Natick garden club; Wellesley village school gardens; Cobbett School garden, Lynn; and school gardens, Fairhaven; on the improvement of the Tracy School grounds, Lynn, and on children's home gardens. A list of prizes and gratuities awarded in 1906 is added.

Hints for school gardens, A. H. Kirby (*Imp. Dept. Agr. West Indies Pamphlet, 48, 1907, pp. 56, dgm. 1*).—This is a revision of a pamphlet published in 1901, and contains general instructions as to size of plats, discipline, distances for planting and period of growth, directions for box and pot cultivation, eight preliminary lessons in the garden, special instructions for growing different vegetables, and directions for budding, grafting, and pruning. Practically every primary school in the West Indies now includes elementary agriculture in its curriculum, and this pamphlet is intended for the use of the teachers in these schools.

Spring in the school garden, Susan B. Sipe (*Atlantic Ed. Jour., 2 (1907), No. 8, pp. 22–24, figs. 5*).—Suggestions are given for planting the school garden, conducting the work, and correlating it with other instruction.

Farm arithmetic and field investigations, G. F. GARRETT (*Jour. Ed.* [*Boston*], *65* (*1907*), *Nos. 14, pp. 377, 381, 382; 15, pp. 410, 411; 17, pp. 458, 459*).—In part 1 of this article 11 farm problems and investigations are given. These relate to land measurements, cost of production, net profits, relative feed values, losses in storage, weights and measures, dairy problems, and the conditions of growing wheat. Part 2 shows how some Iowa boys make money, namely, by entering a corn contest at the State fair, by milk testing during summer vacations, and by caring for a cow and selling clean. rich milk. Part 3 gives an explanation of how the earth breathes.

The soil and its relation to plants, B. M. DAVIS (*Miami Bul., 6. ser., 1907, No. 3, pp. 35, figs. 6*).—This is Teachers' Bulletin No. 1 of the Department of Natural History and Elementary Agriculture, Ohio State Normal College, Miami University, Oxford, Ohio. The exercises outlined represent work that has actually been done by pupils of the sixth to eighth grades. The bulletin is intended as an aid to teachers in introducing elementary agriculture into their schools, and includes 21 experimental studies relating to the root systems of plants, water in soils, soil formation, kinds or types of soils, some of the physical characteristics of soils, and the relation of soils under different conditions to plant growth. Lists of reference books and pamphlets and apparatus required for the work outlined, as well as means for keeping plants alive during cold weather, are appended.

Western Illinois State Normal School soil experiment field, J. T. JOHNSON ([*West. Ill. State Normal School*] *Circ. 1, pp. 4*).—A statement of the purpose, location, and plans of conducting the field.

The Grout farm encampment, A. J. BILL (*Agr. Col. Ext. Univ. Ill.* [*Circ.*], *1906, Dec., pp. 42, figs. 10*).—This is an account of an agricultural education encampment by 54 boys on the farm of A. P. Grout, Winchester, Ill. Besides various forms of entertainment, regular lessons in agriculture were provided.

[Dairy lessons for public schools], W. J. FRASER (*Agr. Col. Ext. Univ. Ill., 1907, Dairy Lessons 1, pp. 4, figs. 4; 2, pp. 8, figs. 5; 3, pp. 4, figs. 3; 4, pp. 4, figs. 2*).—These 4 circulars treat of the following topics: Story of Gold and Gilt, when the cows come home, cow paths that lead far apart, and the bondage of the dairyman.

Nebraska corn book, E. C. BISHOP (*Lincoln, Nebr.: Dept. Pub. Instr., 1906, pp. 80, figs. 48*).—This is a manual prepared for the boys and girls of Nebraska taking part in the corn-growing and cooking contest of 1907. It gives directions for contestants and exhibitors, and information concerning the history of corn, its use as food, its structure and composition, the selection and testing of seed corn, the growing of corn, and rules for judging corn exhibits. Less detailed information is given for wheat, oats, rye, barley, rice, potatoes, and sugar beets.

For exhibitors in the domestic science work there are directions for the preparation of exhibits, recipes for cooking and canning, and some instructions in needlework.

Nebraska Boys' and Girls' Associations—Organization, E. C. BISHOP (*Univ.* [*Nebr.*] *Bul., 12. ser., 1907, No. 16, pp. 3, 4*).

Corn cultivation, V. KEYSER (*Univ.* [*Nebr.*] *Bul., 12. ser., 1907, No. 16, pp. 5–12, figs. 2*).—For instruction of boys who entered the Nebraska corn contests.

Corn, cotton, and chicken contests for Georgia schools and school children, 1907 (*Bul. Univ. Ga., 7* (*1907*), *No. 4, pp. 48, figs. 21*).—Announcements concerning the contests for 1907 are followed by suggestions for the study of corn, cotton, and poultry, including score cards for each of these.

A little lesson in judging cattle, C. S. PLUMB (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *2* (*1907*), *No. 9, pp. 4–10, figs. 10*).

Local weather signs, J. W. SMITH (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *2* (*1907*), *No. 9, pp. 11-13*).—The following subjects are considered: Clouds, barometer changes, humidity, sun spots and the weather, and the moon and the weather.

Mosquitoes, H. OSBORN (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *2* (*1907*), *No. 10, pp. 4-12, figs. 8*).—An account of where mosquitoes lay eggs, what changes take place before they can fly, how the number may be diminished, and how malaria may be spread by mosquitoes.

Drainage, A. G. McCALL (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *3* (*1907*), *No. 1, pp. 4-10, figs. 9*).—An elementary lesson in drainage, with illustrations to suggest experiments in drainage.

MISCELLANEOUS.

Twentieth Annual Report of Maryland Station, 1907 (*Maryland Sta. Rpt. 1907, pp. XX+318*).—This contains the organization list, a report by the director on the work and expenditures of the station, a financial statement for the fiscal year ended June 30, 1907, and reprints of Bulletins 110-118.

Thirteenth Annual Report of Montana Station, 1906 (*Montana Sta. Rpt. 1906, pp. 99-184*).—This contains the organization list and financial statement for the fiscal year ended June 30, 1906, a report of the director on the general work of the station during the year, lists of station publications, donations, loans, and exchanges, and departmental reports, the experimental work of which is noted elsewhere in this issue.

Seventeenth Annual Report of New Mexico Station, 1906 (*New Mexico Sta. Rpt. 1906, pp. 66*).—This includes the organization list, a report of the director on the work and publications of the station, a list of station publications available for distribution, departmental reports on the various lines of station work conducted during the year, and a financial statement for the fiscal year ended June 30, 1906. Reports of the work in horticulture, irrigation, and animal husbandry are noted elsewhere in this issue.

Sixteenth Annual Report of Oklahoma Station, 1907 (*Oklahoma Sta. Rpt. 1907, pp. 64*).—This contains a report of the director, a list of station publications available for distribution, a summary of the press bulletins issued during the year, meteorological observations noted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1907. The press bulletins are in part a repetition of matter published in the regular bulletins of the station. Those not abstracted elsewhere in this issue treat of Oklahoma wheat experiments, wheat pasture experiments, dairy work at the college and station, and summer forage crops.

Experiment Station Work, XLII (*U. S. Dept. Agr., Farmers' Bul. 305, pp. 32*).—This number contains articles on the following subjects: Extension of rice culture, growing seed potatoes under mulch, manure as a summer mulch in forcing houses, renewal of old orchards, injury by Bordeaux mixture, gluten flours and similar foods, laxative properties of wheat bran, emmer as a feeding stuff, roots for farm animals, cabbage as stock feed, pasturing hogs, cull beans as a feed for hogs, and healthy poultry.

Accessions to the Department Library, April-June, 1907 (*U. S. Dept. Agr., Library Bul. 64, pp. 75*).

Annals of the royal agricultural high school of Portici (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 6* (*1906*), *pp. 402, pls. 9, figs. 49, map 1*).—The first series of these annals cover the period 1875 to 1898. The second series brings the reports of investigations up to 1906 and includes mainly papers on the effect of electricity on plants, chemical studies of volcanic rocks and soils, particularly those of Vesuvian origin, effect of fluorids on germination of seeds, histological and chemical studies of plants, malaria and sanitation, and studies on *Anajapyx vesiculosus*, *Litomastix truncatellus*, a new species of Coccidæ, classification of Leucaspis, and polymelia of the ilium and polydactyly in cattle.

Sixth annual general report of the department of agriculture and technical instruction for Ireland (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 6 (1905-6), pp. VI+551*).—This report gives the administration and work of the department for the year 1905-6.

NOTES.

California College.—Among the short courses announced for the coming winter at the university farm at Davis is one in wine making and wine testing from January 2 to 8, which is intended for wine makers of some experience.

Connecticut State Station.—Harry R. Stevens has been appointed chemist.

Illinois University and Station.—Eugene Funk has been elected a member of the board of trustees. An appropriation of $7,500 annually was granted by the last legislature for investigations in floriculture. An advisory committee of five members of the State florists' association and the director is to decide upon the lines of work to be carried on. A. C. Beal has been appointed assistant in floriculture in the station.

Indiana Station.—A horticultural and soil improvement special train was run through the southern part of the State from November 19–22, as the result of cooperation by the railway companies in equipping and operating the train, and the station and State horticultural society, which furnished the speakers. The horticultural lectures were in charge of C. G. Woodbury, and the soil improvement work, which dealt largely with the use of fertilizers, was under the supervision of Director Goss. A dairy special train, operated along similar lines and in charge of members of the dairy department of the station and representatives of the State Dairy Association, was operated from December 9–13.

Kansas College and Station.—The new State fertilizer law, under which the fertilizer control work is transferred from the State board of agriculture to the station, went into effect September 30. A text-book on elementary agriculture, written by different members of the college faculty, will be issued in a series of monthly pamphlets under the direction of the superintendent of college extension. A pamphlet on Soils has already been issued, and others will follow on How Plants Feed, Tree Culture, Birds and Insects, Hygienic Cookery, Live Stock on the Farm, etc. The *Industrialist* notes the recent death of Rev. Elbridge Gale, professor of botany and horticulture from 1870–1878.

Louisiana Stations.—J. G. Lee has resumed his duties as assistant director of the Calhoun Station, after a year's leave of absence on account of ill health, and J. B. Garrett, who has been acting director, has taken up entomological work in the sugar-cane district.

Some cooperative experiments have been arranged by this station with the Forest Service of this Department in the preservation of fence posts, and the use of loblolly, or old field pine, for this purpose. Good fence-post timber is becoming rather scarce, and it is expected that this species of pine, which is quite abundant, can be profitably used for fence posts, shingles, and other farm purposes. E. J. Watson, for many years horticulturist of the station, and J. R. Hall, chemist at the Audubon Park Station, have resigned to engage in commercial work. J. G. Grossenbacker, of the New York State Station, has been appointed plant pathologist of the Baton Rouge Station.

The Audubon Park Station, with the assistance of the New Orleans Park Commission, has succeeded in producing more than one hundred seedling sugar canes during the past year, some of which made remarkable growth. The cuttings are now being planted for the next year's crop.

Massachusetts Station.—The station is forming plans for substation experiments in fruit culture, especially apples, in a number of different localities. A 3-acre cranberry bog has been leased in Wareham for a term of 5 years, and will be used primarily for experiments in methods of control of cranberry insects. Walter E. Dickinson has resigned as assistant chemist.

Missouri Station.—L. D. Haigh, a graduate of the University of Michigan, has been appointed assistant in agricultural chemistry.

Nebraska University.—The forest club of the university is holding a series of lectures dealing with the forest trees of the world, forest insects, fungus diseases of trees, forest conditions, the handling and utilizing of the National forest reserves, and related topics.

North Dakota College.—A correspondence course in agriculture has been established for residents of the State. It is stated that, while the course is open to all classes, it "should appeal especially to teachers who will soon be teaching agriculture in the schoolroom."

Pennsylvania College and Station.—The new group of agricultural buildings was dedicated with appropriate ceremonies on November 22, which was designated as Pennsylvania day. The principal dedicatory address was made by Director Jordan, of the New York State Station. Governor Stuart of Pennsylvania, Acting President Beaver of the college, Director Hunt of the station, and Dr. N. C. Schaeffer, superintendent of public instruction and chairman of the allied agricultural organizations, were also among the speakers.

The buildings just dedicated are among the most completely equipped for agricultural instruction in the country. The main building is a two and one-half story structure, 158 by 73 ft. Adjoining and connecting directly with it in the respiration calorimeter building, a one-story structure 56 by 35 ft. A substantial two-story dairy building completes the group. The base in all of the buildings is of Hummelstown brownstone, with brick superstructure and terra cotta trimmings, and the main building and the dairy building are of fireproof construction. The cost of the entire group was over $300,000.

The main building contains, in the basement, the offices, library, and laboratories of the Institute of Animal Nutrition, a judging room for live stock, facilities for demonstrating methods of handling meat, a laboratory for farm machinery, and rooms for the mailing department. On the first floor are located the offices of the dean and director and of the department of agricultural extension, the class rooms and laboratories of the department of agronomy, the libraries of the school and station, and an assembly room. The second story will be occupied by the departments of animal husbandry and agricultural chemistry, the correspondence courses, and, temporarily, by the department of horticulture. The dairy building contains a creamery, with all modern equipment for making butter, handling sanitary milk, and preparing ice cream, a cheese-making room with vats, presses, and other necessary equipment, rooms for instruction in farm dairying, milk-testing and bacteriological laboratories, and several offices and class rooms.

South Carolina College and Station.—C. E. Chambliss, formerly entomologist, has been appointed State entomologist with headquarters at Columbia, where he will continue his investigation of the insects distributing the rice blast disease. Dr. E. Barnett has been appointed assistant State veterinarian.

Texas College and Station.—C. E. Sanborn, of the Bureau of Entomology of this Department, has succeeded A. F. Conradi as entomologist.

Virginia College.—Short winter courses for farmers in agriculture, animal husbandry, horticulture, and dairying have been offered for the first time, beginning December 2 and continuing 3 weeks. Lectures were given in agricultural chemistry and fertilizers, soils and maintenance of fertility, stock breeding and feeding, dairying, fruit growing and marketing, farm crops, farm machinery, land measurement and leveling, birds, insect pests and plant diseases, and demonstrations in stock judging, dairying, farm machinery, silo and ensilage machinery, fruit spraying, etc.

West Virginia College.—A good-roads school will be opened February 23, 1908, and continued for 4 weeks. The State department of good roads, the State geological survey, and the inspector of highways will cooperate with the university in conducting this school.

New Experiment Stations in Mexico.—Pursuant to an offer of the Mexican federal government to give land for the establishment of an agricultural experiment station in the State of Puebla, an estate of 2,470 acres at Xopala, in the district of Zacatlan, has been selected. The location of this station is about 60 or 70 miles from the coast in a northeasterly direction from the City of Mexico, where the climate is moist and hot, and the principal agricultural productions are vanilla, coffee, cacao, sugar cane, rubber, medicinal and dye plants, sarsaparilla, citrus fruits, etc.

Petitions are being circulated in San Juan Bautista with the idea of appealing to the department of the interior for cooperation in the establishment of an agricultural experiment station in that State.

Guam Experiment Station.—The agricultural experiment station organized in Guam in 1905 has begun the dissemination of information through bulletins for free distribution to residents of the island. Bulletin No. 1 treats of vegetable growing, and No. 2 of means of combating the cocoanut scale.

Apiculture Stations in Wurttemberg.—Under the leadership of Herter a system of 15 apiculture stations has been established in Wurttemberg for the purpose of making accurate daily observations upon the amount of honey gathered by each swarm, the work of the bees, and the weather conditions. These data are tabulated and forwarded to the director at Hohenheim, who collates and publishes them for the benefit of the beekeepers in Wurttemberg.

New Journals.—The members of the Association for the Advancement of Agriculture and Animal Husbandry for Venezuela have undertaken the publication of a weekly, entitled *Revista de Agricultura y Cria.*

The *Journal of the Board of Agriculture of British Guiana* has been established as a quarterly, with the object of "supplying in a popular form information of an agricultural character suited to the requirements of this colony."

Forestry Notes.—At the Pennsylvania State Forest Academy, which is conducted under the direction of State Forester G. H. Wirt, work has begun on a new $15,000 dormitory. The school offers a three-year course consisting of practical work in the summer months on the Mount Alto Reservation and class work during the winter months. Ten students have graduated from the institution and 29 are now enrolled.

Harvard University has recently received a gift of about 2,000 acres of forest land in central Massachusetts, besides $5,000 for the repair and equipment of buildings. The tract, which is considered one of the best forests in the State, will be utilized for practical work by the forestry school.

The British Government has acquired a 12,000-acre estate known as Inverliver, in Argyllshire, Scotland, for the purpose of converting it into a state forest station. The estate is situated on the shores of Loch Awe, in one of the most sparsely populated districts of the Highlands, and is surrounded by mountains and moorland.

A committee has been appointed to inquire into and report upon the question of the improvement of forestry in Ireland. Among the topics to receive special attention will be the present provisions for state aid to forestry, the means whereby under the present statutes existing woods may be preserved and land suitable for forestry acquired, and the financial and other provisions necessary for a comprehensive scheme of afforestation.

A recent consular report states that through the influence of the Touring Club of France a manual of elementary forestry has been introduced into the primary schools of that country. This club has also published a Manual of Forests illustrating the advantages of preserving the forests of the country and containing a constitution and by-laws for tree-planting societies.

Agricultural Education.—A writer in the London *Times* says: To one very important condition of success both advocates and opponents of *la petite culture* in England pay, we suspect, too little regard—namely, the improvement of agricultural education, for the heads as well as for the rank and file of the industry.

In too many of our country districts it is hardly yet realized that education is necessary at all. Landowner and tenant farmer are alike disposed to lay blame for the rural exodus on such education as is given to the laboring classes—an education which it may be admitted has not always been best adapted to fit them for a country life and pursuits. But they forget that education is, after all, but an incident of the great social and economic changes that have come over English life in the past half century, and that if all our elementary schools could be restricted to-morrow to teaching "the three R's" and all boys sent out to farm work at 10 or 11 years of age there would still remain the daily newspaper, the bicycle, and the excursion train to give the laborer that wide outlook and "progressive desire" which is what really draws him away from the land.

So far from there being, as Squire Oldacre and Farmer Hodge are apt to think, too much education already, what is needed is much more of it, but of a different kind; education in the elementary school that will bear directly on country life and inspire some taste for it; education continued afterwards in evening schools or technical instruction classes to widen the knowledge and sharpen the wits of those who are to cultivate the soil and to instill into them at least the beginnings of scientific method. The day of rule-of-thumb is over, in agricultural as in other industries; the day of science—that is, of trained and organized knowledge—has begun, and the nation or class that despises it must fall behind.

It is not undue treatment in freight charges nor unpatriotic preference for foreign goods that enables the small Danish butter farmer, for instance, to undersell the Englishman on his own markets, but superior education and scientific method applied to the organization of his industry; and we may be sure of this, that it will be useless to keep a man on the land, or to bring him back to it, by the inducement of ownership or any other attraction unless we can educate him to do the best for himself and for the land, in an age which calls for cultivated intelligence and scientific method.—The London *Times*, quoted in *Science*.

First Agricultural High School in Michigan.—The first county school of agriculture and domestic science to be organized under the Michigan law of 1907 was opened at Menominee on November 18. The two-year course recommended by the State superintendent of public instruction will be followed. J. F. Wojta, formerly of the Minnesota School of Agriculture, has been chosen superintendent.

A New County School of Agriculture in Wisconsin.—Bulletin No. 1 of the Winnebago School of Agriculture and Domestic Economy has been received. This school is located at Winneconne, Wis., and was opened to students November 4. K. L. Hatch, formerly superintendent of schools at Waterloo, Wis., has been elected principal and teacher of agriculture. The courses in agriculture and domestic economy will be very similar to those offered by the schools in Dunn and Marathon counties.

Agriculture in Alfred University.—Courses in general agriculture, horticulture, advanced agronomy, and economic entomology were offered in Alfred University, Alfred, N. Y., during 1906–7, and it is announced that additional courses will be given as needed in the future.

An Agricultural School in Bolivia.—A recent bulletin of the department of colonization and agriculture of Bolivia announces that the legislature has appropriated $8,200 for the establishment of an agricultural school at Cochabamba. The exact location for this school is now under consideration. It is the intention to develop this institution into a national institute of agriculture, with other institutions to be established in the country, as follows: A practical school of agriculture and animal husbandry at Tarija, a viticultural and enological station or school at Cinti, a special school of tropical agriculture at Santa Cruz, an office or station of zootechny and veterinary medicine at Trinidad, and a special high-altitude agricultural school for La Plaz, Oruro, and Potosi.

Agricultural Education in Scotland.—At the annual conference of the Scottish Chamber of Commerce in Glasgow, October 23, resolutions were adopted favoring the inclusion of agriculture in the curriculum of the day schools, and instructing the directors to take the necessary steps for bringing this about. The Board of Agriculture and Fisheries was requested to consider the appointment of a departmental commission to inquire into the present condition of agricultural education and research in Scotland, the commission to correspond in scope to that now in progress in England.

Agricultural Education in Austria.—According to a note in a recent number of *Wiener Landwirtschaftliche Zeitung*, there were in 1906–7 195 institutions in Austria giving instruction in agriculture and forestry.

These include 6 institutions established within the year, namely, the agricultural division of the Royal Imperial Technical High School at Prague, the Royal Imperial Agricultural Educational and Experimental Institute at Spalato, the farm school at Mikozin, agricultural winter schools at Judenburg and Friesach, and the domestic science school at Chrudim.

The schools making up the total include the following: Three high schools, 3 higher agricultural institutes or academies, 9 agricultural secondary schools, 5 higher forestry institutes, 2 higher institutes for viticulture, pomology, and horticulture, 1 higher institute for the brewing industry, 43 lower agricultural schools, 75 agricultural winter schools, 10 lower forestry schools, 17 dairy and domestic science schools, 23 lower special schools for gardening, pomology, viticulture, and hop, alpine, and bee culture, 2 brewing schools, and 2 distillery schools.

The Growth of People's High Schools and Agronomic Schools in Denmark.—According to figures recently published by the Danish bureau of statistics, the number of people's high schools in that country has increased from 3 in 1844 to 71 in 1906, while the attendance in these institutions has grown from 36 to 6,282. Of agronomic schools, there were 5 in 1844, while now there are 14 and the attendance has increased from 42 to 1,126.

Elementary Agriculture and Forestry in Belgium.—The communal council of Schaerbeck has decided to give instruction in the elements of horticulture and forestry in one of the parks of Brussels to pupils from the primary schools.

During the winter of 1907–8 short courses in elementary agriculture will be held in 346 communes of the Kingdom, each course to be accessible to not more than 20 pupils.

Proposed Scheme of Agricultural Education in the Argentine Republic.—An advisory commission has reported to the minister of agriculture of the Argentine Republic a scheme for a system of agricultural education in that country, including different grades of theoretical instruction in agriculture, schools for instruction in special branches of agriculture, practical instruction in agriculture, etc., and has drawn up a proposed law embodying its recommendations.

Agricultural Education in Victoria, Australia.—The farmers' classes organized by the department of agriculture in 1902, when they were held in 3 centers, have increased in number until in 1906 they were held at 18 centers, with an attendance of 1,320 persons. During the present year arrangements have been made for conducting the classes in 26 centers.

Attached to the viticultural station, at Rutherglen, is an area of 800 acres which it has been decided to work as a general farm, and at the same time to utilize the buildings originally intended for a college as an educational center for the orphans from the neglected children's department. Twenty-two boys are now being trained in farm and vineyard work, and preparations are complete for receiving 15 more boys. One hundred acres are cultivated, and there are 300 sheep and 70 cattle, chiefly dairy cows, on the farm.

The agricultural high schools which have been recently opened at Warrnambool and Sale are said to be receiving good support, and active steps are being taken to establish four others. The conditions for the establishment of these schools provide that half the cost of the buildings shall be obtained locally, together with 20 acres of land, and that an attendance of at least 50 pupils shall be guaranteed at a fee of about $40 a year each.

Short Courses in Agriculture in the Transvaal.—Vacation courses, comparable to short winter courses in American colleges of agriculture, were held during the 3 weeks following June 24 at the Rhodes University College. The subjects included veterinary science and diseases of stock, breeding of Merinos and Angoras, agricultural chemistry, agricultural geology, farm irrigation and dam construction, law of water and water rights, plant diseases, ostrich raising, insects and insect control, mechanics and meteorology, and farm surveying and leveling.

Extension of Agricultural Institutions in Spain.—An act of October 12 provides for the establishment of an experiment field with irrigation equipment on the Santa Teresa Estate, near Seville, for educational and experimental purposes, a laboratory and educational institution in connection with the agricultural school at Madrid, and an experiment field at Motril, in the Province of Granada. The organization and equipment of these institutions has been placed in charge of the state engineer for agriculture of East Andalusia, under the supervision of the general director of agriculture of the ministry of public works.

The United States Consul-General at Barcelona reports the promulgation of a recent government order creating traveling schools of agriculture for the remote districts of Spain. The order provides for a course of experimental and practical instruction to be given every year by itinerant lecturers selected from the agricultural engineers of the district schools of agriculture located at Zaragoza, Jaen, Palencia, Badajoz, and Barcelona, and the two stations at Haro and Villafranca del Panadés.

Itinerant Agricultural Instructors in Trinidad.—Instruction in agriculture by means of itinerant lecturers has been carried on in Trinidad since 1902. These instructors visit any plantation upon application of the owner and also give lectures in schools and other public places. During the past year 260 visits were made in 52 different places and 564 lectures were given. One hundred and forty visits were made to schools and 32 lectures were given at the training school.

Farm and Home Management School for Women.—A recent number of *Illustrierte Landwirtschaftliche Zeitung* gives an interesting account of a school for women at Maidburg, Germany, which affords training in home economics and agricultural subjects intended to prepare women to take charge of farm homes, including the kitchen, garden, poultry, etc. Adjacent to this school is a training school which affords facilities for young women who wish to prepare to teach home economics. A similar school is to be opened in the spring of 1908 at Scherpinger, in West Prussia. One of the possible developments of schools of this class, it is suggested, will be to make them social and educational centers for the rural communities, with lectures, entertainments, and libraries maintained in connection with the schools for the benefit of all the people in the vicinity.

School Gardens.—A series of articles on this subject is contributed by H. J. Wright to *Agricultural Economist.* Detailed instructions for the cultivation of different crops are given.

It is announced in *The Country Gentleman* that the Chautauqua Institution offers to provide 6 weeks' preliminary training in school gardening next summer to any rural school-teacher in Chautauqua County who will undertake this work and carry it out as a feature of elementary instruction in agriculture. The Chautauqua Pomona Grange will aid in perfecting plans for this course and will arrange for 6 scholarships to further promote the work.

In Ceylon there are now 117 government schools in which gardens are being carried on. The seeds and implements are supplied by the government, and the gardens are visited as often as possible by the superintendent of school gardens and his assistant.

State Department of Apiculture in Germany.—A State department of apiculture, under the direction of Dr. A. Fleischmann, was established on November 1 in connection with the Zoological Institute of the University of Erlangen. This institution includes a scientific division under the direction of Dr. Enoch Zander, and a practical division under the direction of Karl Hofmann. The *Deutsche Landwirtschaftliche Presse* in its account of this new institution calls attention to the fact that it is the first of its kind in Europe.

French Silk Schools.—According to the *Journal of the Society of Arts*, two schools in Lyon teach silk culture. One of these (Ecole Supérieur de Commerce) receives pupils from foreign countries and teaches them the entire silk business from the raising of the worm to making the designs, weaving the silk, and putting it on the market. The course of study covers two years. The second school (Ecole Municipal de Tissage et de Broderie) is conducted by the city and is intended only for the children of the inhabitants, although foreigners are received on equal terms with the natives.

Measures before Congress.—Bills introduced into Congress at the opening of the session include the following: For the maintenance of agricultural colleges in Congressional districts, to establish branch experiment stations, to establish agricultural high schools and branch experiment stations connected therewith, to establish a Bureau of Public Roads in this Department, directing the Office of Public Roads to cooperate under certain conditions in the improvement of rural roads, to acquire national forest reserves in the Appalachian Mountains, for national aid in various drainage projects, to establish a national wood-testing laboratory, authorizing further experiments and demonstrations by this Department with the cotton boll weevil and other pests, and providing additional funds for the eradication of the Texas fever tick and the gipsy moth. Most of these measures were introduced into the last Congress, but failed of passage.

Northwestern Live Stock Show.—The first annual show of this association was held at St. Paul, November 19–22. The North Dakota College won a large number of prizes, especially in the swine classes, and the Minnesota College of Agriculture had a notable exhibit, though not entered for competition. W. J.

Kennedy, of the Iowa College and Station, was one of the judges, and among the speakers and demonstrators from the colleges and stations were J. H. Shepperd, of North Dakota; Director Randall, D. A. Gaumnitz, and M. H. Reynolds, of Minnesota, and A. T. Peters, of Nebraska. A student stock-judging contest, in which 4 colleges participated, resulted in the award of first and third places to Minnesota, second, fifth, and eighth to South Dakota, fourth and fifth to Washington, and sixth to North Dakota.

Miscellaneous.—W. R. Buttenshaw, botanist in the Indian Agricultural Service, died suddenly September 9, at the age of 30 years. He was from 1899–1903 lecturer in agricultural science in Jamaica, and scientific assistant in charge of publications at Barbados until May, 1907.

A studentship in medical entomology was recently established at Cambridge University on the basis of a grant from the tropical diseases research fund, administered by the British colonial office. A. H. Lees, King's College, has been appointed to the position.

B. N. Wall has been appointed head of the agricultural department in Southeastern Agricultural College, W. G. Godwin head of the chemical department, and C. F. Gimingham head of the newly established department of soil bacteriology.

The *Boletim da Agricultura, Viacao, Industria e Obras Publicas* of Bahia, Brazil, announces the establishment this year of an agricultural institute under the direction of Dr. L. Zehntner.

A department of economic biology has been established at Bristol University College for the purpose of giving gratuitous information to farmers, fruit growers, and those engaged in fisheries in the western counties of England.

The Minister of Industries and Public Works of Chile has ordered the establishment of a veterinary station under the direction of Francisco Calvanese in connection with the Practical School of Agriculture at Concepcion, similar to the station now connected with the Normal School of Agriculture at Santiago.

According to a note in *Science*, Daniel Berthelot has been appointed director of the laboratory for plant physics and A. Muntz director of the laboratory for plant chemistry at the Meudon Experiment Station.

Prof. M. Hollrung has severed his connection with the Experiment Station for Plant Protection at Halle, and the station has been united with the Agricultural Chemical Experiment Station at that place, and transferred to the rooms of the latter institution.

A recent number of *Illustrierte Landwirtschaftliche Zeitung* states that Doctor Lubers, of the agricultural school at Dahme, on October 1, has become director of the newly opened agricultural school at Bojanowo, in the Province of Posen.

The Lieutenant-Governor at Libreville, in the French Kongo, has issued an order designating Director Bories, of the Trial Garden at Libreville, as instructor in practical agriculture in the normal school of the Colony of Gabon.

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EXPERIMENT STATION RECORD.

VOL. XIX. JANUARY, 1908. No. 5.

The position of agricultural chemistry as a teaching subject in German universities and schools of agriculture has become a matter of apprehension on the part of its followers, and has lately been the subject of discussion in the public press. The chief parties to the discussion have been the Association of German Experiment Stations and the Director of the Ministry of Agriculture, Domains, and Forests, Dr. H. Thiel. As the birthplace of agricultural chemistry and until recently the place of its highest development, this discussion and the facts leading up to it are matters of more than local interest, as well as the bearing of the subject on the organization of instruction and experimentation in agriculture.

There has long been a feeling in Germany that agricultural chemistry was not receiving the recognition due to it, and was not maintaining the position it formerly occupied. Of late, it appears, it has not held out such possibilities for a career as to induce young men to enter it. It is thus considered to be on the wane, as a result of the attitude toward it, and this condition is felt to be detrimental alike to agricultural instruction and to the future of agricultural research.

The importance of this matter led to its being made a special topic for discussion at the meeting of the association last winter. On that occasion Prof. Th. Pfeiffer, of Breslau, presented a paper in which he showed the decline of agricultural chemistry in German universities, and maintained that at present it does not occupy a position commensurate with its importance or equal to that of other branches of agricultural science. Of nine universities concerned only two, Königsberg and Breslau, have full (*ordinarius*) [a] professorships in agricultural chemistry, and four others have only limited professorships, which do not entitle their occupants to a voice in the deliberations of the faculty, and in only a few instances permit them to hold final examinations. Under the German university system this latter provision has considerable influence on the courses elected by students.

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[a] In German universities professors are of two grades, *ordinarius* (full or unlimited) and *extraordinarius* (limited or subordinate).

The universities of Leipsic, Kiel, and Giessen offer no opportunities for the study of agricultural chemistry under the direction of specialists. In two universities, Göttingen and Halle, full professorships when vacated have been reduced to limited, and in Leipsic, where such men as Knop and Stohmann labored with notable success, agricultural chemistry has been completely dropped. In Kiel, Emmerling was permitted to lecture on agricultural chemistry as a *privat docent* to the end of his life, and since his death no representative of this specialty has been appointed. It was mentioned, furthermore, that at that university not a single full professorship in any branch of agriculture is provided.

The conditions at the agricultural high schools and academies were said to be somewhat better, although not all that could be wished for, the position and activity of the agricultural chemist often being limited. Professor Pfeiffer stated that at present there is not a single *privat docent* in agricultural chemistry in all Germany, and hence there are no young men in training for that specialty. This condition was ascribed to the present position of agricultural chemistry in Germany, and the small future which it holds out to a man entering it.

From its history this specialty was shown to be a most important pillar of agricultural science, fully entitled to rank among the foremost subjects in agricultural instruction. Unless it can be maintained in its former position, it was predicted that the development of agricultural investigation and agricultural instruction in Germany must surely be retarded. In view of the importance of the matter and the inconsistency of the present attitude, it was decided to petition the German Agricultural Council for assistance in bringing about increased attention to the teaching of this subject, and in obtaining fuller recognition for it in German universities.

Closely following the above discussion, Dr. H. Thiel, of the Ministry of Agriculture at Berlin, presented a paper before the International Agricultural Congress at Vienna on the subject of higher instruction in agriculture. In the course of this paper, Doctor Thiel laid down the general proposition that the natural sciences in their applications to agriculture should be taught in the respective departments of these sciences, and not in such departments as agricultural chemistry. He contended that the way should be opened for the agricultural student to learn the principles of natural science on which agriculture rests directly from the general sciences themselves—that is, in those departments of science. This plan, he explained, is ideal at present, and would presuppose the provision in these departments of facilities suited to the special needs of the agricultural student in the form of lectures, laboratories, seminars, and instructors. When these conditions are fulfilled, he maintained that agricultural chemistry, "a bastard made up of the various sciences," can be eliminated from the course of instruction; and he declared that this "stop gap" is out of place except where the needs of the agricultural student are not fully met by the respective branches of natural science.

This characterization of agricultural chemistry and its function was quite naturally resented by the friends of that specialty, not only as being grossly unfair to that subject which has in so large a measure furnished the basis for agricultural instruction, but as a reversion to an obsolete and impracticable system. The matter was taken up at the meeting of the Association of German Stations in September, 1907, and Thiel was replied to in the public press.

It was contended that if Thiel's characterization were true, Liebig, with a large part of his life work, and a long list of other chemists like Henneberg, Knop, Wolff, Boussingault, Gilbert, and others, are to be regarded as "stop gaps," servants of a "bastard science," which has no place in the ideal curriculum. An army of agricultural chemists who are carrying on a work of recognized importance in every country of the civilized world would be dissolved, and those in whose hands the research in plant and animal nutrition has rested since the time of Liebig would have no place in the institutions of learning.

It was shown that the same contention would apply equally well to all applied science, and that logically all such branches must be stricken from the programme as individual departments of study and be restored to the respective departments of pure science on which they rest. What the agricultural chemists formerly taught would fall to the various branches of natural science—chemistry, botany, zoology, geology, etc. But in these departments the student of agriculture would not find what he needs, for, it was pointed out, at no university have the professors in general science concerned themselves with the special needs of the agricultural student, and these professors already have so broad a field to cover that they must needs restrict their lectures to principles and general facts.

Furthermore, the association laid down the broad principle that it is one thing to know the essential facts of a single branch of natural science, and quite another thing to be able to marshal the facts of various sciences and to formulate from them principles which apply to the phenomena of agriculture. Although agricultural chemistry, like all applied sciences, draws its stock in trade from the primary sciences like chemistry, botany, geology, etc., the manner in which it handles these facts makes its methods essentially distinct and gives it an individuality. It is a characteristic and a strength of every applied science, in contradistinction to the primary sciences, that it attempts to work out and master the complex phenomena in the whole range of its field without regard to the limitations of a single science, whereas the primary sciences view the field from a special angle. This point of view is not changed when instruction in chemistry, physiology, botany, etc., is presented to agricultural students with an agricultural color.

The association called attention to the rapid rate at which specialization is taking place within pure as well as applied science, a condition which will continue to increase with the development of science. Agricultural chemistry is, therefore, entirely in accord with the progress of the times, and its retention as one of the special divisions of chemistry is entirely logical.

Doctor Thiel in his reply to the association maintained his contention that the field covered by agricultural chemistry should be assigned to special instructors in the basal sciences, and that when these conditions were met and the agricultural student received thorough and systematic instruction in all the branches of natural science with special reference to agriculture—when he had learned the laboratory methods of chemical, microscopic, physiological, and other lines of work, then the agricultural chemist would have nothing new or important to offer him; and, furthermore, he queried what possible line of questions the agricultural chemist could put in examination which would not be covered equally well by the teachers of agriculture and the various natural sciences.

Enlarging upon his plan he explained the methods of making field and feeding experiments, of studying the soil, and the like, the student would receive in connection with his study of the special sciences, and he refused to recognize in agricultural chemistry any method or point of view which differs in any way from that of the respective sciences "in whose field its investigations lie."

From the standpoint of teaching Doctor Thiel holds that the recognition of such specialties as agricultural chemistry brings with it the danger that the agricultural student, especially when he continues his studies for only a short time, will be tempted to restrict the lectures he hears to those in specialties like agricultural chemistry which give him something of the different sciences, rather than to take the more fundamental science courses. This apprehension is undoubtedly well founded, and such a preference seems so natural for a student with limited time that the question arises, Why not? It is perhaps one of the strongest arguments for agricultural chemistry that it gives the student an insight into the applications to agriculture of principles of science which would otherwise be closed to him.

This further exposition of Doctor Thiel's views met with equal dissension from the agricultural chemists, whose last reply he has declined to discuss. The disagreement on the essential features of organization for agricultural instruction seems to be complete. Some good may, however, result from the airing which has been given the subject.

The proposal to divide up instruction in the principles of agriculture among the various primary sciences is a reversion to a plan which was long tried abroad as well as in this country, and proved entirely inadequate. The plan is not materially strengthened by the supposition that these various sciences are to be taught in their special relations to agriculture, for the limitations of the various sciences considered individually would still stand in the way. The trouble lies with the attempt to classify agricultural instruction solely on the basis of the fundamental sciences.

A thorough grounding in the natural sciences is confessedly essential to thorough agricultural courses; but so long as the instruction is confined to the departments of pure science it has had and will have very little significance or importance to agriculture. The teaching of the sciences in their relation and applications to agriculture requires a broad outlook and a special point of view which the teacher of general science rarely if ever possesses. It requires sympathetic relations with the various natural sciences, as well as with the practice of agriculture, for the problems are so complicated that they overstep the boundaries of any single primary science.

Agricultural chemistry, like agriculture, is a composite, and it makes use of scientific facts outside the domain of chemistry. It thus calls for broader interests and relationships, and for the special ability to marshal the facts of general science and apply them to the solution of agricultural problems. Analyze and separate it into the primary sciences to be taught separately and independently by the various departments, and we have destroyed the whole significance and application of this knowledge as far as agriculture is concerned. Either the various departments of science must do just what agricultural chemistry has been doing—lap over into the adjoining sciences and gather data to help explain certain principles and phenomena, or the student must be left to work out these things for himself—an impossible task.

The case is no simpler with investigation. The attempt of the botanist to work out the theory of plant nutrition would at once lead him over into the fields of chemistry and other branches of science, with which he must needs form a combination quite as essentially a "bastard" as Doctor Thiel declares agricultural chemistry to be. It is the complicated character of problems of the soil, of crop production, animal nutrition, dairying, etc., which calls for specialists who are not confined to the limits of a single science, and which has developed special methods of investigation.

If the divisions of science were strictly adhered to we should have no such thing as agricultural science, no systematic attempt to bring together and classify scientific knowledge in its relations to agriculture, and no scientific basis for agricultural instruction. The composite character of agricultural chemistry and its special point of view are the very traits which give it its great usefulness and make its continued recognition extremely desirable from the standpoint of both instruction and investigation. It has blocked out a special field, which with the further classification of agriculture will doubtless need to be more carefully defined but not eliminated.

The classification of agriculture is no easy task, but it is not to be accomplished by reverting to the basis of the primary sciences. This much we have learned from the experience of the past. Any system which refers the instruction in agriculture to the departments of pure science, even with agricultural specialists in those departments, will fail of efficiency on account of the restricted scope and the special view point imposed by the individual departments. The facts of pure science and the conditions of agricultural practice must be brought together and harmonized. This can not be left to the agricultural student or to the educated farmer.

The present-day plan for the classification of agricultural knowledge and its formulation into courses of instruction has cut loose entirely from the old academic idea. It is based on the application of this knowledge in the natural divisions of agriculture, rather than on its scientific origin. In a large measure it obliterates for its purpose the boundary lines of pure science. We have long since ceased to teach the subject of soils under the head of geology, and are beginning to group the teaching of the theory and practice of crop production into a department of agronomy. This seems to be a fairly logical and workable basis for the arrangement of teaching courses, and a proposal to return to the former basis of the primary sciences would find scant indorsement among men who have studied the pedagogics of agriculture. It would seem, moreover, to have little support in the courses pursued in other special branches of education.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Chemistry and Canadian agriculture, F. T. Shutt (*Science, n. ser., 26 (1907), No. 661, pp. 265–276*).—This is the address of the chairman of the section of agricultural chemistry at the Toronto meeting of the American Chemical Society, reviewing the climatic and soil conditions of the different provinces of the Dominion of Canada and the chemical work which has been done under the author's direction in the laboratory of the Central Experimental Farm at Ottawa, more particularly on the relation of organic matter and nitrogen to the crop producing power of soils. The article includes data relating to the nitrogen content of various leguminous plants, the increase of soil nitrogen due to the growth of such plants, and the evidence of soil enrichment from subsequent crop yields.

Progress in agricultural chemistry during 1906, A. Stutzer (*Chem. Ztg., 31 (1907), Nos. 43, pp. 547–549; 44, pp. 561, 562; abs. in Chem. Zentbl., 1907, II, No. 5, p. 424*).—This is a review of the principal reports of investigations (mainly German) during the year on soils, nutrition of plants, fertilizers, feeding of animals, feeding stuffs, soil bacteriology, and analytical methods.

The constitution of the alkali salts of phenolphthalein and the behavior of phenolphthalein toward alkali solutions of high concentration, B. M. Margosches (*Ztschr. Angew. Chem., 20 (1907), Nos. 5, pp. 181–191; 6, pp. 226–231*).—It is shown that with an excess of highly concentrated alkali solution colorless alkali combinations of phenolphthalein are formed.

A new method for the determination of ammonia, A. Ronchèse (*Jour. Pharm. et Chim., 25 (1907), pp. 611–617; Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 16–17, pp. 900–905; abs. in Analyst, 32 (1907), No. 377, p. 303; Jour. Chem. Soc. [London], 92 (1907), No. 538, II, p. 651; Ann. Chim. Analyt., 12 (1907), No. 9, pp. 366, 367*).—The method described is based upon Delèpine's observations that formaldehyde reacts with ammonium chlorid to form hexamethylene-tetramine, and that if the formaldehyde is in excess all of the acid of the ammonium salt is liberated and may be titrated with standard alkali (tenth-normal sodium hydroxid) using phenolphthalein as indicator.

Methods of estimating the metabolism of nitrogen in subjects in health and disease, M. and H. Labbé (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 16, pp. 826–828*).—From a series of determinations by the Kjeldahl method, the Regnard urea method, and the Mörner method for total nitrogen and urea nitrogen, the conclusion is reached that the first-mentioned method is superior, as the others give too low results.

The determination of potash by the platinum chlorid method, H. J. F. de Vries (*Chem. Weekbl., 4 (1907), pp. 231–242; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 536, II, p. 504*).—"The causes of error in the estimation of potassium by the platinum chlorid method are discussed, and the author's views as to the best means of avoiding them are stated. A summary of work on this subject is given."

The determination of potash and soda in feldspar, G. Dillner (*Jern-Kontorets Ann., 62 (1907), p. 147; abs. in Chem. Ztg., 31 (1907), No. 54, Repert. No. 49, p. 324*).—A slightly modified Lawrence Smith method is described and recommended.

Contribution to the determination of phosphoric acid volumetrically, W. D. Richardson (*Jour. Amer. Chem. Soc., 29 (1907), No. 9, pp. 1314, 1315*).—In view of the inaccuracy of results obtained by the Pemberton volumetric method in the case of superphosphates, the author undertook some investigations which indicated that the error in this case was due to the presence of sulphuric acid. He therefore proposes a method in which the sulphuric acid is precipitated as barium sulphate before the phosphoric acid is determined.

The determination of citric-acid soluble phosphoric acid in Thomas slag, P. Wagner, R. Kunze, and W. Simmermacher (*Landw. Vers. Stat., 66 (1907), No. 4-5, pp. 257-284; abs. in Chem. Ztg., 31 (1907), No. 58, Repert. No. 53, p. 351; Jour. Chem. Soc. [London], 92 (1907), No. 537, II, p. 577*).—This article describes and discusses 5 methods which are believed to give reliable results when carried out strictly according to the directions given in the article. These are the German official method (separating silica by evaporation with hydrochloric acid), the Darmstadt method (separating silica by heating with magnesium citrate mixture), the Naumann method, the molybdic method, and the Lorenz method.

The results obtained by direct precipitation agree with those obtained by the methods named only when the slag extract gives no, or only slight, reaction by the Kellner test.

Of the 5 methods the molybdic method requires greatest care. Then follows the official method (with separation of silicic acid by means of hydrochloric acid), Naumann's method, Lorenz's method, and the Darmstadt method.

The Lorenz method is not suited to routine laboratory work. The results are accurate, but the method requires much attention to details. The unavoidable nitric acid fumes are disagreeable and the weighing of the hygroscopic precipitate must be done with care.

Although the official method with direct precipitation in extracts giving no reaction by the Kellner test yields reliable results, it is recommended that in all cases silicic acid be precipitated by heating with citrate of magnesia mixture and the phosphoric acid precipitated by addition of ammonia to the filtrate. This method, which is designated the Darmstadt method, is as follows:

To 100 cc. of the citric-acid extract of the slag in a 200 cc. flask add 50 cc. of a citrate of magnesia mixture prepared by dissolving 2 kg. of citric acid and 400 gm. of ammonium chlorid in 2 liters of water, adding 5 liters of 20 per cent ammonia, cooling, adding 550 gm. of magnesia chlorid, and making the volume to 10 liters with water. Heat gently, for about 15 minutes, over a small Bunsen burner flame, until the silicic acid separates out. Swing the flask a few times in order to collect the silicic acid in a mass, and heat over a strong flame to the boiling point. Cool, add 25 cc. of hydrochloric acid of 1.124 sp. gr., and allow to stand for one-half hour. Swing the flask twice during this time. Fill the flask with water, close with a rubber stopper, and shake repeatedly and vigorously until the silicic acid floccules are finely divided. Filter, and to 100 cc. of the filtrate (corresponding to 0.5 gm. substance) add 50 cc. of 10 per cent ammonia and stir for one-half hour in a Stutzer apparatus.

The method is recommended as accurate and well adapted to routine laboratory work.

Determination of nitric acid in the soil, S. Frankfurt and A. Dushechkin (*Vyestnik Sakh. Promuish., 1906, No. 44, pp. 652–660; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, p. 250; Chem. Abs., 1 (1907), No. 17, p. 2285*).—The conclusions of the authors are as follows: (1) The hitherto accepted method of determining nitric acid in soils by digesting the soil with water during 48 hours gives results considerably too low; (2) two-hour digestion is sufficient to extract the nitric acid from the soil. Longer contact of water with the soil renders the use of chloroform or other similar agent necessary.—P. FIREMAN.

The obtaining of the soil solution in unaltered condition, V. Ischerekov (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, pp. 147–166*).—The method proposed consists in the displacement of the aqueous soil solution by another liquid, such as ethyl or methyl alcohol. The soil is placed in a glass tube covered at the bottom with closely woven linen and the alcohol is poured over it; after some time, the length of which depends on the height of the alcohol column and the degree of saturation of the soil, the aqueous solution begins to flow out through the linen filter. When a layer of half a centimeter of alcohol was poured on a saturated soil drops of liquid began at once to flow through the linen. With a layer of 10 to 15 cm. of alcohol there was a steady flow of drops of the aqueous solution. With a soil containing, for example, 24 cc. of water, about 23 cc. of clear aqueous solution was obtained before the outflowing liquid showed any turbidity indicating admixture of alcohol. The aqueous solution was perfectly transparent, without any traces of turbidity or precipitate, but slightly colored yellow by the humus matter. In case of soils with varying degrees of humidity, and especially with sandy soils, it was found necessary to pack the soil in the tube in order to prevent the flowing of the alcohol through free passages.

In experiments described by the author 100-gram samples of a sandy soil received, respectively, 10 cc. and 20 cc. of water and the aqueous solution was displaced by alcohol. The hygroscopic moisture of the soil was 0.41 per cent; hence there was in one sample 10.41 cc. and in the other 20.41 cc. of water. In the former case 8 cc. and in the latter 16.5 cc. of aqueous solution was obtained. Seven cubic centimeters of the first solution and 10 cc. of the second were evaporated and the residue dried at 105° C. The residue from the 7 cc. was 0.0261 gm., indicating 0.0388 gm. of dissolved substances in the 100 gm. of the soil. The residue from the 10 cc. was 0.0187 gm., indicating 0.0382 gm. of dissolved substances in 100 gm. of soil. Thus the addition of more water did not perceptibly increase the salt content of the solution.

In another experiment 300 gm. of a sandy soil received 53 cc. of water. The outflowing solution was collected in separate portions. Portion 1 contained 15 cc., portion 2, 20 cc., and portion 3, 17 cc., the last portion being quite turbid and mixed with alcohol. The entire first portion and an equal amount of the second were evaporated and dried at 105° C. There were obtained, before ignition, from portion 1, 0.0411 gm., and from portion 2, 0.0425 gm., and after ignition, from portion 1, 0.0086 gm., and from portion 2, 0.008 gm. In the third portion the salt content was greatly reduced by alcohol.—P. FIREMAN.

The interaction between minerals and water solutions with special reference to geologic phenomena, E. C. Sullivan (*U. S. Geol. Survey Bul. 312, pp. 69*).—This bulletin reports work undertaken in the chemical laboratory of the U. S. Geological Survey "in an attempt to apply chemical methods to the investigation of geologic processes and especially of the secondary deposition of ores," accompanied by an outline of earlier work along this line on filtration and diffusion and chemical reaction.

The method of procedure in the experimental work was in general as follows: "The mineral, finely ground in an agate mortar, was left several days at room temperature, with occasional shaking, in a well-stoppered flask with twice its weight of the solution. Whether contact was for a few hours or a few months made little difference. The liquid was filtered through a double layer of filter paper in a Gooch crucible, which, except in the case of pure-water extracts, retained the finest powders and gave perfectly clear filtrates. A measured quantity of the filtrate was subjected to analysis. After addition of acid, silica was removed by evaporation, iron and aluminum were precipitated with ammonia, and calcium was separated with ammonium oxalate. Ammonium salts were then driven off by heating, and magnesium was precipitated and washed with barium hydroxid solution and weighed as the sulphate. The barium hydroxid contained a trace (less than 0.1 per cent) of impurity, chiefly potassium and sodium, for which a correction was applied in the one or two cases in which it was of significance. In the filtrate from magnesium hydroxid barium was precipitated with ammonium carbonate, reprecipitated, and the alkalis in the filtrate were weighed as chlorids and separated in the usual way. Repeated tests of the alkali chlorids for magnesium gave, as a rule, an unweighable trace at most—rarely a few tenths of a milligram."

The determination of numic acid in soils, G. H. Coops (*Chem. Weekbl. 4 (1907), pp. 315–321; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 537, II, p. 590*).—The method employed was as follows: Boil about 10 gm. of the soil repeatedly with absolute alcohol, recovering the bulk of the alcohol by distillation and restoring the original volume by addition of water (Fresenius's method). Filter off the solution containing the soluble humic acids from the waxy and resinous matters and titrate with tenth-normal barium hydroxid.

"The precipitate formed, which may be converted into barium sulphate, represents those humic acids which form insoluble barium compounds. The filtrate on addition of sulphuric acid yields a further quantity of barium sulphate representing soluble barium salts of humic acids. The residue from the alcoholic extraction contains other humic acids. It must be remarked, however, that humic compounds are present, which under the influence of alkalis gradually yield additional humic acids."

Heat the mass with addition of a little water on the water-bath for half an hour, with careful addition of tenth-normal potassium hydroxid until neutral. Filter the solution and wash the residue a few times (this is much assisted by centrifugal action), and then digest with an equivalent amount of tenth-normal sulphuric acid, uniting the two extracts. As a check, mix one-half of the solution with a saturated solution of potassium sulphate, thus precipitating certain humic acids, and titrate the filtrate with tenth-normal potassium hydroxid. Shake the other half well with ether, which removes any colloidal silica as an emulsion. After submitting to centrifugal action siphon off the bottom layer and divide it into three portions. Mix one of these with a saturated solution of potassium sulphate, and titrate the filtrate with tenth-normal potassium hydroxid. Titrate the second portion with tenth-normal barium hydroxid. Convert the soluble and insoluble barium salts formed into sulphate and weigh. Carefully neutralize the last portion with tenth-normal potassium hydroxid and precipitate with ferrous ammonium sulphate, collecting and weighing the precipitate, which, allowing for the iron oxid contained therein, represents gallic acid derivatives. Finally calculate all results on air-dry and ash-free soil.

Extracting with citric acid as a means of determining the fertility of soils, S. Frankfurt and I. Novikov (*Vyestnik Sakh. Promuish., 1906, Nos. 46, pp. 721–726; 47, pp. 758–765; 48, pp. 801–808; 49, pp. 838–846; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, pp. 249, 250*).—

The authors describe numerous investigations which lead them to the conclusion that the application of weak acid extractions in general and of citric acid extraction in particular as a means of determining the fertility of soils and of their responsiveness to fertilizers, does not have sufficient basis.—P. FIREMAN.

Determination of carbon dioxid, W. H. WAGGAMAN (*Abs. in Science, n. ser., 26 (1907), No. 660, p. 244*).—This is an abstract of a paper read before the Toronto meeting of the American Chemical Society, giving an account of a modification of an apparatus previously described by Cameron and Breazeale and of results obtained with it on a number of organic compounds and carbonate minerals.

The determination of nitrogen in water by elementary analysis, M. RUBNER (*Arch. Hyg., 62 (1907), No. 1, pp. 83-91*).—As a result of tests of this method the author proposes as a substitute for it a colorimetric modification of the Kjeldahl method.

A rapid method for the determination of calcium in water, and its significance in connection with the analysis of water for boiler purposes, F. E. HALE (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 1078–1085*).—The method proposed is an adaptation of the old and standard method based upon the precipitation of the calcium as oxalate, the decomposition of the calcium oxalate with sulphuric acid, and the titration of the liberated oxalic acid with potassium permanganate. It is claimed that the modified method is very accurate and gives a complete analysis in 30 minutes.

"The method is admirably suited for the routine analysis of large numbers of samples, may be considered accurate to 2 parts per million, is applicable to all quantities of calcium including that of sea water, is equally accurate with large and small quantities of calcium, furnishes, in combination with the soap method, a rapid method of determining the total magnesium, and hence is extremely valuable in the rapid analysis of mineral and boiler waters."

Determination of the hardness of water, P. NAWIASKY and S. KORSCHUN (*Arch. Hyg., 61 (1907), No. 4, pp. 348–354; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 537, II, p. 579*).—The authors recommend and describe Pfeiffer's methods for temporary and total hardness and Monhaupt's method for magnesia.

The determination of manganese in water, R. S. WESTON (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 1074–1078*).—The author describes and recommends a modification of Schneider's method, which is based upon the fact that in the presence of an excess of nitric acid a manganous salt is oxidized to permanganic acid by bismuth tetroxid.

Swiss food book (*Schweizerisches Lebensmittelbuch. Bern, 1906, 2. rev. ed., pt. 3, pp. IX+95; rev. in Hyg. Rundschau, 17 (1907), No. 17, pp. 1053–1055*).—Official methods for the examination of meat and meat products, legumes and products made from them, bread and other flour products, spices, coffee and coffee substitutes, tea, cocoa, and chocolate.

Food inspection methods of analysis (*Jour. Off. Répub. Franc., 39 (1907), No. 193, pp. 5032–5034*).—Official methods are given for the examination of cider, perry, flour, and meal, for the detection of tin in cakes and molasses, and for the detection of preservatives and artificial sweetening substances.

Preserved vegetables containing copper and its estimation, C. BREBECK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 9, pp. 548–552*).—In the method which the author outlines for determining copper in vegetables, the material is incinerated, evaporated with hydrochloric acid, treated with ammonia, and the copper precipitated in a platinum dish by inserting a strip of pure zinc. He states that metallic copper adheres firmly to the platinum.

The water found in the cans of preserved vegetables, according to the author, contains no copper, even when large amounts are found in the vegetables themselves, and the same is true of the vinegar from pickles containing copper. It is his custom to disregard such liquid in determining copper.

The guaiac reaction for determining the quality of flour, A. Corsini (*Riv. Ig. e Sanit. Pub.* [*Rome*], *16* (*1906*), *No. 19; abs. in Hyg. Zentbl.*, *2* (*1907*), *No. 22, pp. 689, 690*).—The value of the guaiac reaction for judging the quality of flour is insisted upon and data regarding its use are reported.

Some experiments on the oxidation of flour and milk, A. Corsini (*Arch. Farmacol. Sper. e Sci. Aff.*, *6* (*1907*), *No. 6, pp. 357–362*).—This work covers much the same ground as that noted above.

The behavior of wheat and rye flour to methylene blue and to starch paste, with notes on the formation of higher alcohols, F. Schardinger (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *18* (*1907*), *No. 24–25, pp. 748–767, fig. 1*).—Differences in behavior of the two sorts of flour to methylene blue and to starch paste at a given temperature were noted. Notes are included regarding micro-organisms which form higher alcohols from flour.

A source of error in the use of petroleum ether for fat extraction, J. Marshall (*Amer. Jour. Pharm.*, *79* (*1907*), *No. 7, pp. 315–317*).—In a commercial petroleum ether derived from the Pennsylvania oil field the writer found an appreciable quantity of residue after distilling and evaporating, which makes it "evident that a petroleum ether of this sort is not adapted for use in making extractions." Residue was also obtained from commercial "ethyl ether distilled over sodium."

Experiments on the Maumené test and the iodin value of certain oils. E. Richter (*Ztschr. Angew. Chem.*, *20* (*1907*), *No. 37, pp. 1605–1614, figs. 3, dgms. 4*).—Different forms of apparatus for use in carrying on the Maumené test are described and results of studies with rape seed, poppy, peanut, and olive oil and mixed oils are reported.

Report on the work of the agricultural chemical control station of Saxony, 1906, H. C. Müller (*Ber. Agr. Chem. Kontrollstat. Halle, 1906, pp. 47*).—A brief account is given of the personnel of the station and the very extensive control work done during the year, which included the examination of 38,930 samples of various products, including 8,075 samples of fertilizers, 2,214 samples of feeding stuffs, 22,776 samples of milk and dairy products, and 4,877 samples of seed, besides various other miscellaneous materials.

Unification of terms used in reporting analytical results, C. G. Hopkins (*Jour. Amer. Chem. Soc.*, *29* (*1907*), *No. 9, pp. 1312–1314; abs. in Science, n. ser.*, *26* (*1907*), *No. 660, p. 249*).—This is an abstract of a report presented at the Toronto meeting of the American Chemical Society embodying the recommendations which had already been made to the associations of Official Agricultural Chemists and of American Agricultural Colleges and Experiment Stations (E. S. R., 18, p. 415).

A new shaking device for the chemical laboratory, J. M. Camp (*Jour. Amer. Chem. Soc.*, *29* (*1907*), *No. 8, pp. 1210, 1211, pl. 1*).—The apparatus described "consists of a frame supporting a vertical shaft, which is revolved by a six-inch pulley wheel. The upper part of the shaft is bent slightly from the perpendicular. Encircling the bent portion of the shaft is a hub which in turn supports a flat disk on which the flasks to be shaken are attached. The hub and disk are prevented from turning, when the shaft is revolved, by suitable teeth on the under side of the hub meshing into corresponding teeth on the top of the supporting frame." The apparatus gives a pitching and tossing motion which is said to be very effective for the purpose intended.

Apparatus for use in determinations of the fat content in cream, butter, margarin, etc., Wendler (*Milch Ztg., 36 (1907), No. 35, pp. 410, 411, figs 6*).—The author describes a modification of the test flasks used in the Gerber butyrometer, whereby "a quicker and more convenient, and, therefore, more exact reading" of the proportion of fat in the sample is possible.

METEOROLOGY—WATER.

Monthly Weather Review (*Mo. Weather Rev., 35 (1907), Nos. 7, pp. 303–334, figs. 5, charts 7; 8, pp. 345–388, figs. 2, charts 6*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of July and August, 1907, recent papers bearing on meteorology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 7.—The Fundamental Interval in Meteorological and Climatological Studies, especially in Charts of Isohyetal Lines; A Possible Case of Ball Lightning (illus.), by W. H. Alexander; Studies on the Phenomena of the Evaporation of Water over Lakes and Reservoirs, by F. H. Bigelow; Tornado at Parkersburg, W. Va.; Australian Climatology (illus.); Electric Spark Produced When Ice is Formed; The Jamaican Weather Service (illus.), by D. T. Maring; and Interesting Lunar Corona, by C. M. Hammond.

No. 8.—Influence of Temperature and Moisture upon the Rate of Growth of Tobacco (illus.), by G. N. Coffey; Studies of Frost and Ice Crystals, by W. A. Bentley; Cottier's Resistance of Elastic Fluids; A Summary of the History of the Resistance of Elastic Fluids (illus.), by J. G. C. Cottier; Local Forecasting at Escanaba, by W. P. Stewart; Lightning Phenomena, by I. Langmuir; Salton Sea and Local Climate; Tornado at Maple Plain, Minn.; Hail Shooting in Italy; Influence of the Glass Cover on Actinometric Thermometers, by L. Gorczynski, trans. by R. A. Edwards; Report on the Great Indian Earthquake of 1905, by C. F. Marvin; and The New Public Weather Service of Germany, by P. Polis, trans. by G. E. Rausch.

Meteorological observations, J. E. Ostrander and T. A. Barry (*Massachusetts Sta. Met. Buls. 225, 226, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1907. The data are briefly discussed in general notes on the weather of each month.

The climate and soils of the Panhandle area [of West Virginia], G. P. Grimsley, T. A. Caine, and G. W Tailey, Jr. (*W. Va. Geol. Survey, County Rpts. 1906, pp. 308–366, figs. 10, map 1*).—The chapter on climate summarizes the meteorological observations made at Wheeling since 1876, at Highland Springs near Wellsburg since 1890, and at New Cumberland since 1901.

The chapter on soils is a report of a survey made by the Bureau of Soils of this Department and published elsewhere in this issue (p. 417).

Mt. Rose Weather Observatory, 1905–1907, J. E. Church, Jr. (*Sierra Club Bul., 6 (1907), No. 3, pp. 177–185, pls. 4*).—This is an illustrated account of this observatory, which has already been referred to (E. S. R., 18, p. 529.)

Annual report of the director of the [Philippine] Weather Bureau for the year 1904, J. Algué (*Ann Rpt. Philippine Weather Bur., 1904, pt. 3, pp. 562*).—This third part of the annual report of the director of the Philippine Weather Bureau gives detailed tabular summaries of meteorological observations of the secondary stations in the Philippine Islands during 1904.

Rainfall conditions of South America, E. L. Voss (*Mitt. Justus Perthes' Geogr. Anst., 1907, Engänzungsh. 157, pp. V+59, charts 19, dgm. 1*).—The available data are summarized and charted with reference to amount and daily, monthly, seasonal, yearly, and regional distribution.

Work of the central meteorological bureau in 1906, J. J. A. Bouquet de la Grye (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *6* (*1907*), *No. 7, pp. 827–832*).—This article summarizes the work of the bureau during the year on climatology and general meteorology throughout France, as well as in Algeria and Tunis, and describes briefly the improvements in equipment of various local observatories, the functions of the meteorological commissions of the different departments of France, and the progress made in France and abroad in the investigation of the cause and possible prevention of hail.

The climate of São Paulo, J. N. Belfort de Mattos (*Bol. Agr.* [*São Paulo*], *8. ser., 1907, No. 6, pp. 260–264*).—This is a brief general description of the main climatic features of the region.

Correlation of the weather and crops, R. H. Hooker (*Jour. Roy. Statis. Soc., 70* (*1907*), *No. 1, pp. 1–51*).—In amplification and extension of the ideas advanced by W. N. Shaw (E. S. R., 18, p. 713), the author calculates the correlation coefficients between rainfall and temperature of various periods and the yield of wheat, barley, oats, peas, beans, potatoes, turnips, ruta-bagas, mangel-wurzels, and hay in a selected area, consisting of the counties of Lincoln, Huntingdon, Cambridge, Norfolk, Suffolk, Essex, Bedford, and Hertford, England. In tracing the relation between rainfall and crop yields he assumes that the maximum coefficient indicates the period of greatest influence, and on this basis discusses in detail the figures obtained for each of the individual crops.

The discussion following the reading of this paper indicated the prevalence of the opinion that the data presented were suggestive rather than conclusive, but that such papers as this and those by Shaw open up a new and very promising field of investigation.

Precipitations, their income and outgo in relation to droughts, M. Neruchev (*Zap. Imp. Obshch. Selsk. Khoz. Yuzh. Ross., 1906, No. 4–6; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 1, pp. 119, 120*).—The author attributes the droughts in Southern Russia, not so much to deficiency of precipitation as to excessive loss of the moisture, mainly through evaporation. He quotes different investigators, from which it appears that in Southern Russia the evaporation not only absorbs the entire precipitation, but considerably exceeds it. If this is the case, the question arises, from what source does the plant derive its water supply? To this Professor Klossovski gives the following answer: The losses of water in the form of evaporation are compensated by the power, not only of the soil, but also of the rock species to condense in their pores considerable quantities of water absorbed from the atmosphere. The atmospheric moisture is absorbed by the soil, and compensates the losses by evaporation. This being the case, it would seem that severe droughts in Southern Russia are due to the unproductive expenditure of the soil moisture through excessive surface run-off in case of torrential rains and, in the author's opinion, in part to imperfect absorption by the soil, due to shallow plowing.—P. FIREMAN.

Deficient humidity of the atmosphere, T. A. Starkey and H. T. Barnes (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 12* (*1906*), *Sec. III, pp. 203–211*).—The injurious effects of excessive dryness in the air of houses and means of overcoming such unfavorable conditions are described.

International catalogue of scientific literature. F—Meteorology (*Internat. Cat. Sci. Lit., 5* (*1907*), *pp. VIII + 283*).—This is the fifth annual issue of this catalogue, covering mainly the literature of 1905, but also including some references to the literature of 1901 to 1904 omitted from previous issues.

Surface water supply of [different regions of the United States], 1906 (*U. S. Geol. Survey, Water-Supply and Irrig. Papers Nos. 202, pp. 77, pls. 2,* *figs. 2; 203, pp. IV + 100, pls. 4, figs. 2; 204, pp. V + 110, pls. 5, figs. 2; 205, pp. 123, pls. 3, figs. 2; 206, pp. VI + 98, pls. 3, figs. 2*).—These bulletins contain reports in the usual form on the progress of stream measurements in the Hudson, Passaic, Raritan, and Delaware River drainages, by H. K. Barrows, N. C. Grover, et al.; Middle Atlantic States, by N. C. Grover et al.; Southern Atlantic and Eastern Gulf States, by M. R. Hall et al.; Ohio and Lower Eastern Mississippi River drainages, by M. R. Hall, N. C. Grover, A. H. Horton, et al.; and Great Lakes and St. Lawrence River drainages, by H. K. Barrows, A. H. Horton, et al. The methods employed in making the measurements are briefly explained.

Fresh water, K. KNAUTHE (*Das Süsswasser. Neudamm, 1907, pp. VIII+663, figs. 194*).—In this volume the author has summarized a large amount of data on water analysis, the relation of water to fish culture, flora and fauna of fresh water, the value of different waters as food for marine life, and water bacteria and ferments. The volume as a whole constitutes a handbook on fresh water with special reference to its utilization for fish culture and related topics. Author and subject indexes are provided.

The use of ice on the farm, J. A. RUDDICK (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 20, pp. 8, fig. 1*).—"This bulletin is intended to encourage the practice of providing a supply of ice for the needs of the household and the dairy, and to furnish information to those who may not have had any experience in the storing and handling of ice."

Water—a hydrologic study, E. A. MARTEL (*L'Eau—Étude Hydrologique. Paris, 1906, pp. 87–200, figs. 22*).—This is one part of a general treatise on hygiene, and treats the subject of water mainly from the standpoint of potability. Potable water is defined as that which is clear, fresh, pure chemically and bacteriologically, and may be drunk with pleasure and without danger to health.

The conditions which render it so difficult, if not practically impossible, to secure water supplies measuring up to this high standard, and the best means of insuring the highest possible quality, are quite fully set forth in the various sections of the article dealing with the circulation of subterranean water and the sources and means (sanitary and legal) of prevention of contamination of water. The sanitation and water supply of Paris receives special attention.

In judging of the quality of subterranean waters it is considered of prime importance to know whether they are drawn from smaller interstices or from fissures and other large underground channels. The nature and importance of this distinction is explained at some length with numerous illustrations and examples, and the author's classification of subterranean water is based upon it. A detailed description of the qualities constituting a good water is given.

The principles of water purification, L. M. WACHTER (*Proc. Ann. Conf. Sanit. Off. N. Y., 6 (1906), pp. 105–112*).—The principles of precipitation, sedimentation, and filtration as means of purifying water are briefly explained.

Direct and indirect methods of electrical purification of water, H. LEFFMANN (*Jour. Franklin Inst., 164 (1907), No. 3, pp. 205–216, figs. 5*).—A few of the electrical processes proposed for the removal of mineral impurities or for destroying micro-organisms are described.

The economical purification of sewage in rural districts, T. A. STARKEY (*Brit. Med. Jour., 1907, No. 2437, pp. 671–673*).—This article discusses especially the disposal of sewage by decomposition in a septic tank and oxidation in a filter bed or by irrigation.

The nature of sewage and its proper disposal, J. A. AMYOT (*Proc. Ann. Conf. Sanit. Off. N. Y., 6 (1906), pp. 113–123*).—Various sources of pollution of streams are briefly described, and sewage disposal by means of broad irrigation, intermittent sand filtration, contact beds, sprinkling or continuous filters, with preliminary or auxiliary treatment by sedimentation, septic tanks, and aeration are explained.

SOILS—FERTILIZERS.

The moisture equivalents of soils, L. J. Briggs and J. W. McLane (*U. S. Dept. Agr., Bur. Soils Bul. 45, pp. 23, pl. 1, fig. 1*).—Moisture equivalent is defined as "the percentage of water retained by a soil, when the moisture content is reduced by means of a constant centrifugal force until it is brought into a state of capillary equilibrium with the applied force," i. e., until the water held in the larger capillary spaces is removed.

The centrifugal machine devised for the work is described and the results of preliminary studies of various factors—duration of test, initial water content, speed, etc.—upon the accuracy of the determinations are reported.

The method adopted and used in the determination of the moisture equivalents of over 100 samples of soils is essentially as follows: "The soils under investigation are first thoroughly moistened, and are then placed in the perforated cups of a centrifugal machine, where they are subjected to a constant centrifugal force until they cease to lose moisture. The percentage of water remaining in the soil is then determined."

It is held that by this means it is possible to reduce the moisture content of a soil until it is no greater than the moisture content of the soil under favorable field conditions, and thus to determine the retentive power of different soils for moisture when acted upon by the same definite force, comparable in magnitude with the pulling force to which the soil moisture is subjected in the field. "Furthermore, this method of comparing the relation of soils to moisture avoids to a large extent, if not entirely, the errors due to differences in packing, since the soils are packed by centrifugal force, which acts upon each individual particle. This is further safeguarded by the high speed employed, which is sufficient to remove the moisture from any large capillary spaces that may possibly be formed. . . .

"A series of soils which have thus been brought into equilibrium with the same force will be in capillary equilibrium with one another when brought into contact, and no capillary movement of moisture will take place between them. In other words, the moisture equivalents of a series of soils represent the moisture contents which those soils must have in order to make it equally difficult to remove a very small additional amount of moisture from any of the soils. It is from this point of view that the determination of the moisture equivalent becomes of special importance in the comparison of the moisture contents of different soils under growing crops."

The moisture equivalents of over 100 samples of type soils, using a centrifugal force about 3,000 times the force of gravity, were found to vary from 3.6 per cent in the coarser sandy soils to 46.5 per cent in the case of a heavy clay subsoil.

When "these observations were reduced by the method of least squares to determine the influence of the sand, silt, and clay groups, and of the organic matter, upon the retention of moisture, it was found for the whole series that each per cent of clay or organic matter in the soil corresponded to a retention of 0.62 per cent of moisture when the soil was subjected to a force 3,000 times that of gravity. Each per cent of silt, under similar conditions, corresponded to a retention of 0.13 per cent of moisture, and the coarser grades show practically no retentive action against this force. The 'probable error' for these coefficients was rather high, and better results were obtained for smaller series of related soils, using a different set of coefficients. It is interesting to note that the organic matter, for the force employed, has a retentive power no greater than the clay group.

"In investigating the influence of the speed upon the moisture equivalent it was found, for the series of soils examined, that between certain limits the amount of moisture set free when the pulling force is increased by a definite amount is the same for the different soils. In other words, when this series of moist soils is in equilibrium with a given force, and the force is then increased by a definite amount, the amount of water set free is independent of the initial water content. Within these limits, then, a sandy soil and a heavy soil of this series part with equal amounts of moisture."

Soil fertility, M. WHITNEY (*La Fertilité du Sol. Montpellier, 1907, pp. 52, figs. 2*).—A French translation of Farmers' Bulletin 257 of this Department (E. S. R., 18, p. 119), by H. Fabre, of the National School of Agriculture of Montpellier.

Field operations of the Bureau of Soils, 1905 (seventh report), M. WHITNEY ET AL. (*U. S. Dept. Agr., Field Operations of the Bureau of Soils, 1905, pp. 1089, pls. 2, figs. 45, maps 47*).—This report contains a general review of the work of the Bureau of Soils during 1905, by the Chief of the Bureau, together with detailed accounts of the following surveys:

Tompkins county, N. Y., by J. A. Bonsteel, E. O. Fippin, and W. T. Carter, jr.; the Binghamton area, N. Y., by E. O. Fippin and W. T. Carter, jr.; Montgomery county, Pa., by H. J. Wilder, A. T. Strahorn, and W. J. Geib; Chester county, Pa., by H. J. Wilder, T. A. Caine, W. J. Geib, and W. T. Carter, jr.; Upshur county, W. Va., by A. M. Griffen and O. L. Ayrs; Louisa and Hanover counties, Va., by H. H. Bennett and W. E. McLendon; the Yorktown area, Va., by R. T. A. Burke and A. S. Root; Perquimans and Pasquotank counties, N. C., by J. E. Lapham and W. S. Lyman; Duplin county, N. C., by A. S. Root and L. A. Hurst; York and Cherokee counties, S. C., by J. A. Drake and H. L. Belden; Spalding county, Ga., by J. E. Lapham, W. S. Lyman, and C. W. Ely; Leon county, Fla., by H. J. Wilder, J. A. Drake, G. B. Jones, and W. J. Geib; Lauderdale county, Ala., by F. E. Bonsteel, O. L. Ayrs, T. D. Rice, and E. P. Carr; Blount county, Ala., by W. G. Smith and F. N. Meeker; Montgomery county, Ala., by W. E. McLendon and C. J. Mann; Dallas county, Ala., by E. P. Carr, W. E. Hearn, H. H. Bennett, and R. T. A. Burke; the Crystalsprings area, Miss., by J. L. Burgess and W. E. Tharp; Tangipahoa parish, La., by A. M. Griffen and T. A. Caine; East Baton Rouge parish, La., by C. W. Ely, H. W. Marean, and N. P. Neill; Houston county, Tex., by W. T. Carter, jr., and A. E. Kocher; the Waco area, Tex., by A. W. Mangum and M. E. Carr; Lee county, Tex., by J. L. Burgess and W. S. Lyman; Lavaca county, Tex., by C. N. Mooney, F. Bennett, A. T. Strahorn, and H. L. Belden; Henderson county, Tenn., by M. E. Carr and F. Bennett; Madison county, Ky., by A. M. Griffen and O. L. Ayrs; McCracken county, Ky., by T. D. Rice; the Cleveland and Westerville areas, Ohio, by J. E. Lapham and C. N. Mooney; the Oxford area, Mich., by G. B. Jones and M. E. Carr; Newton and Tippecanoe counties, Ind., by N. P. Neill and W. E. Tharp; the Carlton area, Minn.-Wis., by W. J. Geib and G. B. Jones; Portage county, Wis., by F. N. Meeker and R. T. A. Burke; Crawford and Scotland counties, Mo., by W. E. Hearn and C. J. Mann; Sarpy county, Nebr., and the Carrington area, N. Dak., by A. E. Kocher and L. A. Hurst; Brown county, Kans., by J. L. Burgess, W. E. Tharp, and W. S. Lyman; the Grand Junction area, Colo., by J. G. Holmes and T. D. Rice; the Gallatin valley, Mont., by M. H. Lapham and C. W. Ely; the Stockton area, Cal., by M. H. Lapham and W. W. Mackie; and Island county and the Everett area, Wash., by E. P. Carr and A. W. Mangum.

During the calendar year 1905, 21,289 square miles, or 13,624,960 acres, were surveyed and mapped on a scale of 1 in. to the mile, making the total area surveyed and mapped up to the end of that year 110,087 square miles, or 70,455,680 acres. The average cost of the field work in 1905 was $2.66 per square mile.

A new feature of the soil surveys beginning with the year 1905 "consists of the presentation of the results of tests made to determine the manurial requirements of the more imporant types. In these cases large samples of soils were collected and sent to the Bureau for testing by the wire-basket method. These large samples were subdivided and different kinds of fertilizing materials, including barnyard manure, chemical fertilizers, and green crops, were applied to various quantities and in different combinations. Upon the different samples thus treated wheat plants were grown and their growth compared with that of similar plants grown upon untreated check samples. The soil survey reports give the results of these determinations. This testing of manurial and fertilizer requirements will be continued on all the principal types and classes of soils in the region where the use of fertilizers or manure is common or is being introduced. In this way the soil survey reports will not only deal with the appropriate selection of characteristic soils for the production of different farm crops, but will also indicate the proper procedure whereby increased yields of the staple crops may be secured. These two problems, adaptation of soil to crop and the maintenance and increase of crop yields, constitute the great agricultural problems of the country."

Economic geology of the Independence quadrangle, Kansas, F. C. SCHRADER and E. HAWORTH (*U. S. Geol. Survey Bul. 296, pp. 74+VI, pls. 6, figs. 3*).—This is a report of a study of this area of about 950 square miles in southeastern Kansas, adjacent to Indian Territory, giving the results of observations on the geology and mineral resources, as well as of incidental studies on soils, agricultural conditions, water supply, etc.

Agrogeological studies, P. TREITZ (*Jahresber. K. Ungar. Geol. Anst., 1905, pp. 198–247*).—A series of studies of soils, water, economic deposits, geological relation, and agricultural condition of various areas of Hungary is reported.

An analytical study of the cultivated soils derived from the schists of Pont-de-Larn, Tarn, A. DELAGE, H. LAGATU, and L. SICARD (*Ann. École Nat. Agr. Montpellier, n. ser., 6 (1907), No. 4, pp. 268–326; 7 (1907), No. 5, pp. 47–65; rev. in Bul. Soc. Nat. Agr. France, 67 (1907), No. 3, pp. 248–259*).—This paper forms a part of a series of memoirs on the constitution and composition of arable soils, already referred to (E. S. R., 17, p. 841).

Two broad general conclusions arrived at from this work are stated as follows: (1) No observations have been made which warrant the belief that epigenic processes go on in cultivated soils. All observations tend to show that soils are the simple products of disaggregation of rocks. (2) All chemical transformation (dissociation and recombination) to which soils are subject, follow the solution of the mineral constituents in different solvents, but principally in water, which takes place in very small but constant proportion and without decomposition of the mineral constituents. The authors' results are discussed in the light of similar work by Cameron and Bell (E. S. R., 17, p. 742), and various practical applications of them in their bearing on cultivation, fertilizing, etc., are explained.

A study of the sabak of Upper Egypt, R. ROCHE (*Bul. Assoc. Chim. Sucr. et Distill., 24 (1907), No. 11, pp. 1533–1537*).—Analyses of this material, which is the saline débris obtained from sites of ancient villages, are reported and its origin, value, and methods of use are discussed. The analyses reported show it to contain about 1 per cent of potash, 0.65 per cent of phosphoric acid, and 0.44 per cent of nitrogen (0.18 per cent in form of nitric nitrogen).

On the composition of the ashes and lapilli ejected by Vesuvius during the period of activity in April, 1906, N. PASSERINI (*Atti R. Accad. Econ. Agr. Georg. Firenze; 5. ser., 3 (1906), No. 4, pp. 374–385*).—Analyses of a number of different samples are reported and discussed with reference to similar studies of other investigators.

Report on progress in geological peat and moor investigations during 1905 (*Jahresber. K. Ungar. Geol. Anst., 1905, pp. 248–272, pl. 1*).—The report deals with the occurrence, composition, etc., of Hungarian deposits.

The utilization of peat land on the Continent (*Jour. Bd. Agr.* [*London*], *14 (1907), No. 3, pp. 146–155*).—Information is given in some detail regarding the classification, composition, and utilization for agricultural and industrial purposes of peat lands, compiled largely from articles in various German journals.

Results of chemical investigations on a series of moor soils from northwest Germany, B. TACKE and A. SPIECKER (*Ztschr. Forst u. Jagdw., 39 (1907), No. 4, pp. 213–229*).—The results of a somewhat detailed chemical study of a large number of samples of moor soils are reported.

The mineral constituents of the soil solutions, F. K. CAMERON and J. M. BELL (*Ann. Ecole Nat. Agr. Montpellier, n. ser., 6 (1907), Nos. 3, pp. 182–240, figs. 3; 4, pp. 241–267, fig. 1*).—This is a reprint of Bulletin 30 of the Bureau of Soils of this Department (E. S. R., 17, p. 742).

Studies on humus formation, II, S. SUZUKI (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 419–423*).—A continuation of previous investigations (E. S. R., 18, p. 14) is reported in which it was found that protein, starch, and pentosans, but not fat or cellulose, can produce the black matter of humus and that the restriction of air is very essential to humus formation. An examination of 2 samples of humus showed that the nitrogen was in the form of protein.

Organic nitrogen in Hawaiian soils, E. C. SHOREY (*Hawaii Sta. Rpt. 1906, pp. 37–59, pl. 1*).—This article states briefly the present status of the nitrogen problem as related to agriculture, calls attention to the high content of nitrogen in Hawaiian soils, reviews our present knowledge of soil nitrogen, and gives a preliminary report on studies of the nitrogenous compounds in Hawaiian soils, including solubility of the nitrogenous compounds in various solvents, the ammonia produced on distillation with various basic substances, and the character of the decomposition products of the nitrogenous matter of the soil.

By extraction of a soil rich in nitrogen (0.73 per cent) with 5-per cent caustic soda, precipitating with nitric acid, removing the precipitate, neutralizing the filtrate with soda, and again filtering, there was obtained a neutral filtrate which on concentration to small bulk yielded a small amount of dark flocculent, apparently humin, substance. The filtrate from this on precipitation with silver nitrate or lead acetate and decomposition of the precipitate with hydrogen sulphid gave on concentration a small amount of a soluble crystalline substance which was subsequently demonstrated to be picolin carboxylic acid. The occurrence of this substance in Hawaiian soils is taken to indicate the presence of pyridin compounds, which may exert a poisonous effect upon plants grown on the soils.

Nitrifying power of chernozem soils, influence of various factors on it, and quantity of nitrates in the soil at different seasons of the year, V. SAZANOV (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8 (1907), No. 1, pp. 1–38*).—Russian chernozem soils respond readily to application of superphosphate, but have little or no need of nitrogenous fertilizers. In the spring, however, they do not contain enough nitrate to supply the wants of the strongly growing young plants and a nitrate fertilizer is badly needed. Later the nitrification in the soil is enough.

The author studied the variation of the nitrogen content of the soil during the period of vegetation with a good clayey chernozem soil taken from a sugar beet field on which during the experiments no plants were raised but which was cultivated like the adjoining area under beets. The results show that the nitrate nitrogen content of the surface soil in the spring was actually very small (as low as 1.9 mg. per kilogram of dry soil). In the course of the summer it increased, reaching in July and August a maximum of 41 mg.

From the results of this and similar experiments the author draws the following general conclusions: (1) Timely, rational cultivation of the soil so as best to preserve the humidity greatly furthers the accumulation of nitrates, (2) the nitrification process in the chernozem soils is not at all or very slightly influenced by manuring, (3) the plowing under of straw holds back the nitrification process only during the earlier period, (4) plants sowed and then plowed under for green manuring, including leguminous crops, besides making the soil too dry during harvest time, strongly impoverish it in assimilable nitrate nitrogen. Also, later no beneficial influence of green manuring on the nitrification process has been observed.—P. FIREMAN.

Soil bacteriological investigations, Maassen and Behn (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 33–38*).—This is a general statement regarding the character of the work done along this line at the Biological Institute of Berlin.

On the bacteria of the tubercles of various leguminous plants, Maassen and Müller (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 42–44*).—Observations are recorded which show an increase of from 1,248,000 to 8,960,000 root tubercle bacteria of *Trifolium pratense* in 1 gm. of soil in 4 days. Studies of the character of the tubercles produced on roots of leguminous plants are referred to as leading to the conclusion that these tubercles are abnormal growths of purely pathological nature. Contrary to previous conclusions, the authors are of the opinion, in the light of their recent investigations, that the root tubercle bacterium is botanically identical in all cases although modified somewhat in roots of different plants.

As a result of a large number of experiments with different kinds of leguminous plants the authors reach the conclusion that: (1) The organism of *Pisum sativum* will inoculate *Vicia faba*, *V. sativa*, *V. villosa*, *Lens esculenta*, *Lathyrus sativus*, *L. odoratus*, and *L. silvestris*; (2) that of *Trifolium incarnatum* will inoculate *T. pratense*; (3) that of *Medicago sativa* will inoculate *M. lupulina* and *Melilotus officinalis*; and (4) that of *Lupinus luteus* will inoculate *L. angustifolius* and *Ornithopus sativus*. The organisms of *Phaseolus vulgaris*, *Soja hispida*, *and Robinia pseudacacia* will apparently not inoculate any other plants. The same is probably true of the organisms of *Coronilla varia*, *Onobrychis sativa*, *Anthyllis vulneraria*, *Sarothamnus scoparius*, *Amorpha fruticosa*, *Caragana frutescens*, and *Acacia lophanta*, although these have not been so fully studied as the others.

The bacteria of leguminous plants, L. Lauvray (*Jour. Agr. Prat., n. ser., 12 (1906), No. 44, pp. 549, 550*).—A brief note is given reviewing practical tests of pure cultures of these organisms.

The action of carbon bisulphid on the bacteria of soils, Maassen and Behn (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 4, pp. 38–42*).—The results of plat and pot experiments are briefly summarized, showing a great reduction in the total count of bacteria immediately following treatment with carbon bisulphid but later an unusual increase. Streptothrix organisms were decidedly injured by the treatment, but the peptonizing organisms, especially the *Bacillus mycoides* group, were less affected. Especially resistant were all spore forms.

The action of the carbon bisulphid was more marked in the pots than in the field. The spore count was 1.8 to 3.8 per cent of the total count in the case of the field soil after treatment, but 77 per cent in the case of the pot soil. The bacterial flora of the two were very different after treatment.

In a study of the resistance to carbon bisulphid (1.7 parts per 1,000 of water) of various nonspore-forming bacteria in pure cultures, it was found that the different kinds of bacteria showed great variation in resistance. The tubercle bacteria of peas, *Bacillus ruber-purpureus*, *B. stutzeri*, *Vibrio berolinensis*, and *V. phosphorescens* were quickly killed, generally within 2½ hours. On the other hand, the tubercle bacteria of Robinia, *Bacillus præpollens*, *B. prodigiosus*, *B. pyocyaneus*, *Bacterium coli commune*, *Micrococcus ureæ*, and *Proteus vulgaris* survived the treatment for as much as 4 hours. The staphylococci were very resistant, surviving the treatment for as much as 48 hours. *Azotobacter chroococcum* in pure cultures and in soil extracts was killed in 24 hours by 1.7 parts of carbon bisulphid per 1,000 of water at 20° C. In moist soils impregnated with the fumes of carbon bisulphid it survived 48 hours. The results show in general that the vegetable forms of bacteria are, as a rule, destroyed in 24 hours by carbon bisulphid of the strength given.

In similar studies with the mixed bacterial flora of soils the effect of the carbon bisulphid was at its height at the end of 24 hours, little but the spore forms remaining at the end of this period. At the end of 17 days, however, the bacterial count was nearly the same as before treatment, and in from 17 to 30 days there was an increase.

The effect of desiccation on root tubercle bacteria, F. D. Chester (*Delaware Sta. Bul. 78, pp. 15*).—The results of previous investigations bearing upon the effect of desiccation upon different kinds of bacteria are stated to be very variable and confusing. The results of the author's experiments with cultures of *Pseudomonas radicicola* freshly prepared from root tubercles and dried on cotton or in dishes, and with cultures obtained from the Bureau of Plant Industry of this Department lead to the following conclusions:

"(1) *P. radicicola* has little power to withstand drying, and its preservation in the dry state on cotton is inadvisable.

"(2) Fresh cultures, by containing a larger number of active organisms, are better for inoculating cotton than old cultures.

"(3) Cultures dried on cotton and exposed to atmospheric influences die very rapidly, the great majority of the bacteria perishing during and up to the point of complete desiccation, a few more resistant individuals surviving, and these only for a very limited time.

"(4) With the use of fresh, vigorous cultures, dried quickly on cotton, and kept in sealed bottles, *P. radicicola* will survive for a longer time with certain strains and for only a short period with others; but even this method of preparation, which offers the best conditions for preservation, is uncertain.

"(5) *P. radicicola* when dried in thin films on glass perish very rapidly.

"(6) The latter is also true of *P. radicicola* when dried on seed."

On the action of barnyard manure, J. Stoklasa (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 4, pp. 440–471; Fühling's Landw. Ztg., 56 (1907), No. 12, pp. 409–438; abs. in Chem. Zentbl., 1907, I, No. 24, p. 1702*).—The author summarizes and discusses the results of his numerous experiments on the importance of manure as a means of increasing the bacteria content of soils, in increasing the activity of the soil bacteria, and on the influence of this bacterial activity on the plant food and properties of soils.

He concludes that the most beneficial effect on the bacterial activity of the soil is brought about in practice by frequent small applications of manure rather than by large applications at longer intervals, the action of the manure being assisted by thorough aeration of the soil by cultivation, drainage, etc.

On the action of barnyard manure, J. STOKLASA (*Illus. Landw. Ztg.*, *27* (*1907*), *No. 47, pp. 425–427; 48, pp. 433–436*).—This is an abstract of a paper presented at the International Congress of Agriculture in Vienna, and presents in a popular way the well-known views of the author regarding the relation of manuring to bacterial activity in the soil. (See p. 421.)

The world's production and consumption of mineral fertilizers, L. GRANDEAU (*L'Agriculture et les Institutions Agricoles du Monde au Commencement du XX^e Siècle. Paris, 1906, Vol. 4, pp. 277–327, figs. 2*).—This comprises chapters 55 to 59 of the fourth volume of the author's report on agriculture and agricultural institutions of the world at the beginning of the twentieth century, based upon the Paris Exposition of 1900. The subjects discussed are the origin of mineral fertilizers and the increased yield due to their use, the production and use of various kinds of phosphatic, potassic, and nitrogenous fertilizers being considered in detail.

History of the fertilizer industry, W. D. RHEA (*Tradesman, 57* (*1907*), *No. 10, pp. 57, 58*).—This is a brief note on the origin and present status of the industry in general, but dealing more particularly with the fertilizer business of Nashville, Tenn.

The total fertilizer production of the United States is placed at 4,000,000 tons annually, valued at over $60,000,000. It is estimated that Nashville has $3,000,000 invested in the fertilizer business.

Phosphate production in 1906 (*U. S. Geol. Survey, Press Bul. 295, folio*).—This is an advance notice of the chapter of Mineral Resources of the United States for 1906, on phosphate production in the United States.

It is stated that "of the 2,080,957 long tons of phosphate marketed in the United States in 1906 (valued at $8,579,437), Florida produced 1,304,505 long tons, valued at $5,585,578; the Tennessee production was 547,677 long tons, valued at $2,147,991; and South Carolina's production amounted to 223,675 long tons, valued at $817,068. Other States, including Arkansas and Idaho, produced 5,100 tons, valued at $28,800."

The demand for phosphate in recent years has grown more rapidly than the output, resulting in a rise of prices. It is suggested that under these conditions of growing demand and higher prices it is not improbable that many low-grade deposits which it has hitherto been impracticable to utilize may be profitably worked. Reference is made to recently discovered deposits in Tennessee, Utah, Wyoming, Idaho, and Arkansas.

The third German potash congress, WEISKOPF (*Ztschr. Angew. Chem.*, *20* (*1907*), *No. 25, pp. 1025–1062, figs. 2*).—This is an account of the proceedings of a meeting of chemists and others interested in the potash industry at Hildesheim May 4–5, 1907. The more important subjects considered were a report on the basis for a scientific development of the North German potash deposits, including investigations on the solubility of salt mixtures and on the formation and transformation of salts, and physical and mineralogical investigations; the drainage water question in the potash industry; and the industrial analysis of potash salts.

Problems of applied chemistry, G. LUNGE (*Chem. News, 95* (*1907*), *Nos. 2470, pp. 151–153; 2471, pp. 159–162; 2472, pp. 172–175*).—Among the most important problems of applied chemistry referred to in this article is the artificial production of fertilizers, more particularly the production of nitrogenous compounds from the free nitrogen of the air. The relative cost and efficiency and the future possibilities of the Frank and Caro and Birkeland and Eyde processes of preparing nitrogenous compounds are discussed. Attention is also called to the progress which has been made by Frank, Caro, and Mond in utilizing peat for the production of power and of ammonia, as well as the application of the Mond and other processes for the recovery of ammonia from the gases of coke ovens, furnaces, etc.

The synthetical production of foods and feeding stuffs and the application of chemistry in the preparation of foods from new sources and increasing the production from old sources are briefly referred to.

The fixation of nitrogen, N. WHITEHOUSE (*Jour. Soc. Chem. Indus., 26 (1907), No. 13, pp. 738, 739*).—A study of various methods with a view to working out a practical commercial process for the fixation of atmospheric nitrogen as ammonia or nitrate, using a metallic nitride as the nitrogen carrier, is briefly reported. The results are mainly of theoretical interest.

On the oxidation of nitrogen by the action of silent discharges on atmospheric air, E. WARBURG and G. LEITHÄUSER (*Sitzber. K. Preuss. Akad. Wiss., 1907, No. 11–13, pp. 229–234, figs. 2*).—The investigations here reported show that the product of the oxidation of dry atmospheric air by silent discharges is mainly N_2O_5.

On the formation of calcium cyanamid and calcium carbid, E. RUDOLFI (*Ztschr. Anorgan. Chem., 54 (1907), No. 2, pp. 170–184, fig. 1; abs. in Chem. Ztg. 31 (1907), No. 58, Repert. No. 53, p. 351*).—Studies of the formation of calcium cyanamid by the action of nitrogen on crude carbid with and without addition of other substances (calcium chlorid, fluorid, iodid) and from the components lime, charcoal, and nitrogen, are reported. Incidentally the equilibrium temperatures of Rothmund for the formation of calcium carbid out of lime and charcoal were investigated and found too low.

The formation of lime nitrogen, F. FOERSTER and H. JACOBY (*Ztschr. Elektrochem., 13 (1907), No. 12, pp. 101–107; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 8, p. 423*).—Studies of the influence of temperature and of adding calcium chlorid and fluorid are reported.

Contributions to the study of calcium phosphates, H. BASSETT, Jr. (*Ztschr. Anorgan. Chem., 53 (1907), No. 1, pp. 34–62*).—Studies of the hydrates of the calcium hydro-orthophosphates and of the action of ammonia gas on the calcium hydro-orthophosphates are reported.

Phosphates and superphosphates in relation to the sulphur industry, L. TIRELLI (*Rass. Min., 26 (1907), Nos. 7, pp. 101–103; 8, pp. 118–120; abs. in Chem. Abs., 1 (1907), No. 12, p. 1601*).—Laboratory experiments are reported which indicate that it is not practicable to use the sulphur dioxid, formed in the process of extracting sulphur from minerals by partial combustion, in the manufacture of superphosphates.

Fertilizers, A. STUTZER (*Düngerlehre. Leipsic, 1907, 16. rev. ed.; rev. in Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 6, p. 578*).—This is the sixteenth revised edition of this work.

The use of chemical fertilizers, MINANGOIN (*Bul. Soc. Hort. Tunisie, 6 (1907), Nos. 24, pp. 20–26; 25, pp. 81–87*).—This subject is discussed mainly from the standpoint of Tunisian conditions.

Results of field experiments with fertilizers in Belgium, SCHREIBER (*Bul. Agr. [Brussels], 23 (1907), No. 7, pp. 445–485*).—The results of 3 years' experiments with various crops on the typical soils of the different regions of the country are briefly summarized.

Culture experiments and critical studies on the relative efficiency of nitrate of soda and sulphate of ammonia, H. STÜCHTING (*Jour. Landw., 55*

(1907), No. 1, pp. 1–46; abs. in Chem. Abs., 1 (1907), No. 13, p. 1754; Jour. Chem. Soc. [London], 92 (1907), No. 538, II, p. 646).—The author reviews previous investigations upon this subject, discusses the factors affecting the action of the two materials, and reports pot experiments with potatoes, from which he draws the following conclusions: The absolute consumption of water by potatoes was greater in case of ammonium sulphate than in case of nitrate of soda. The absolute water consumption was higher, and the relative consumption considerably lower with potash fertilizers than without them; that is, the water was better utilized with potash fertilizers. Ammonium sulphate gave better yields than nitrate of soda. Only the highest yield of potatoes with nitrate nitrogen equalled the effect of ammonia nitrogen.

The assimilation of nitrogen by potatoes was the same in case of nitrate nitrogen (calcium nitrate) and ammonium sulphate. Probably the sulphuric acid set free by the assimilation processes influenced the utilization of nitrogen unfavorably and the taking up of potash favorably. The sodium residue left in the soil, when present in small amounts, increased the nitrogen assimilation, but when present in larger amounts, reduced nitrogen assimilation. In like manner the soda reduced the assimilation of potash by plants. This action is attributed in part to the alkaline nature of the sodium residue. Unlike other cultivated plants (beets, barley, and carrots) the potato was not favorably influenced by soda directly. The two varieties of potatoes experimented with, July and Silesia, behaved very differently toward this incidental action of the nitrate of soda and sulphate of ammonia.

Experiments with ammonium sulphate, Bachmann (*Fühling's Landw. Ztg., 56 (1907), No. 15, pp. 530–535*).—In continuation of previous experiments (E. S. R., 18, p. 725), the author studied the effect of time of application of ammonium sulphate and the comparative effect of the sulphate and other nitrogenous fertilizers on rye, oats, barley, kohl-rabi, and mangolds on different kinds of soil.

As a rule early application in the spring gave better results than later, and one application than fractional applications. The sulphate gave better results than nitrate of soda or the organic nitrogen of manure.

Field experiments with nitrogen-lime for sugar beets, F. Strohmer (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 35 (1906), pp. 663–675; abs. in Chem. Zentbl., 1907, I, No. 19, p. 1451; Jour. Chem. Soc. [London], 92 (1907), No. 538, II, pp. 646, 647*).—The nitrogen of nitrogen-lime, prepared by the Polzenius process, is in the same form as in lime nitrogen. In the experiments reported, nitrogen-lime gave good results on sugar beets, but the best methods of applying it remain to be worked out and the economy of its use depends upon its cost, which has not yet been fixed commercially.

Previous experiments of this kind have been noted (E. S. R., 18, p. 19).

Comparative fertilizer experiments with lime nitrogen, M. Schmoeger (*Mitt. Deut. Landw. Gesell, 22 (1907), No. 10, pp. 103–105*).—Five years' comparative tests of lime nitrogen, ammonium sulphate, and nitrate of soda on oats and potatoes are reported, showing uniformly best results with nitrate of soda, and slightly poorer and less uniform results with ammonium sulphate. Lime nitrogen was slightly less effective than ammonium sulphate but very similar to it in action.

Experiments with lime nitrogen and nitrogen lime, H. Immendorff (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 9, pp. 93–95; Sächs. Landw. Ztschr., 55 (1907), No. 14, pp. 317–319*).—Experiments with wheat, barley, and oats, show that these fertilizers gave good results as compared with nitrate of soda, and indicate that they may be used with advantage by farmers under suitable conditions.

The question of sulphate of iron, C. Guffroy (*Jour. Agr. Prat., n. ser., 13 (1907), No. 25, pp. 782–786*).—Various experiments with this material as a fertilizer on soils of different character are reviewed.

In experiments with 4 Gramineæ which are reported the sulphate of iron was decidedly beneficial on oats, less beneficial in case of rye, without action on rye grass, and harmful to wheat. The very variable results which have been obtained with sulphate of iron lead to the conclusion that its action is not purely chemical, but that it may influence the biological processes in the soil.

Investigations on the composition and fertilizing value of Posen sewage, Gerlach (*Mitt. Deut. Landw. Gesell., 22 (1907), Nos. 18, pp. 169–174; 19, pp. 177–180*).—The Posen sewage is collected in tanks and is therefore more concentrated than ordinary city sewage, 1 cubic meter of it containing on an average 5 kg. of total nitrogen, 3 kg. of soluble nitrogen, 1.25 kg. of phosphoric acid, and 2.25 kg. of potash. Experiments with rye and potatoes showed that in all cases the sewage was an effective fertilizer, its efficiency, however, depending largely upon the previous crop and the weather.

Experiments on the fertilizing action of olive pomace ashes, D. Vigiani (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 4 (1907), No. 1, pp. 66–70*).—Analyses of this material are reported showing from 11.19 to 25.02 per cent of potash, 10.88 to 19.56 per cent of lime, and 1.74 to 3.85 per cent of phosphoric acid. From the chemical analyses and from experiments with olives, grapes, sweet potatoes, and rape the author concludes that the ashes constitute an excellent fertilizer, rich in potash and phosphoric acid, which can be economically used wherever a supply is available.

The action of the lime waste of sugar factories as a fertilizer, Rupprecht (*Deut. Landw. Presse, 34 (1907), No. 62, p. 503*).—It is stated that this material contains on an average 1.2 per cent of phosphoric acid, 0.2 per cent of potash, and 23 per cent of lime. It is mainly valuable for the lime it contains and gives good results on soils in need of this substance and on plants specially benefited by liming, such as most leguminous plants. The phosphoric acid, though small in amount, is quite effective. The waste is considered most effective when used in connection with manure.

Fertilizer analyses, A. J. Patten (*Michigan Sta. Bul. 248, pp. 16*).—The results of inspection of 145 brands of fertilizers examined during the season of 1907 are reported.

Licensed commercial fertilizers, 1907, F. W. Woll and G. A. Olson (*Wisconsin Sta. Bul. 149, pp. 3–19, 26–28*).—Analyses of 40 samples, representing 22 brands, of fertilizers licensed for sale in Wisconsin in 1907 are reported, with the text of the State fertilizer law; a discussion of the composition and valuation of fertilizers; and suggestions as to the purchase and use of fertilizers.

AGRICULTURAL BOTANY.

The assimilation of atmospheric nitrogen by fungi, Charlotte Ternetz (*Jahrb. Wiss. Bot. [Pringsheim], 44 (1907), No. 3, pp. 353–408, figs. 2*).—While making a study of the turf-inhabiting fungi, the author isolated 8 species living as mycorrhiza on the roots of various common ericads, a preliminary account of which has already been noted (E. S. R., 16, p. 541).

In the present paper technical descriptions are given of 5 new species, *Phoma radicis oxycocci, P. radicis andromedæ, P. radicis vaccinii, P. radicis tetralicis,* and *P. radicis ericæ,* together with a detailed account of their nitrogen assimilating power. All of the species seem to be able to assimilate atmospheric nitrogen in various degrees, the most active being *P. radicis vaccinii, P. radicis oxycocci,* and *P. radicis andromedæ.* These 3 species are doubtless of great economic importance, as for each gram of dextrose consumed they fix 22, 18, and 11 mg. of nitrogen, respectively. *Aspergillus niger* and *Penicillium glaucum* were also found to be able to fix free nitrogen, but in a much less degree. None of the fungi investigated were found to require combined nitrogen for their development.

The rôle of lime in plants, V. GRAFE and L. VON PORTHEIM (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 115 (1906), No. 6, pp. 1003–1037, pls. 2*).—Two series of experiments were made with bean seedlings in Knop's solution to determine the rôle of lime in the assimilation and metabolism of sugars, starch, etc. The seedlings were placed in cultures with and without lime, and 1 per cent each of levulose, saccharose, and dextrose added to different jars. The cultures were kept under observation in light and darkness and their growth and general behavior noted, comparisons being made with seedlings grown in the normal solution.

The development of hypocotyl and roots was best in the series grown in normal solution to which 1 per cent levulose was added. Where lime was omitted the growth was less in every series, and the roots were distorted, brown, and insignificant.

A second series of experiments was conducted at a somewhat lower temperature, but the results were quite similar to those obtained before.

The authors found formaldehyde present in the green plants whether grown with or without lime, but further experiments are said to be necessary to determine whether the injurious action of formaldehyde is inhibited by the presence of lime.

Plants containing hydrocyanic acid, P. GUÉRIN (*Rev. Sci. [Paris], 5. ser., 8 (1907), Nos. 3, pp. 65–74; 4, pp. 106–110*).—The author presents a review of some of the more important contributions to our knowledge regarding the occurrence and function of hydrocyanic acid in plants.

The latent life of seeds, P. BECQUEREL (*Ann. Sci. Nat. Bot., 9. ser., 5 (1907), No. 4–5, pp. 193–311*).—The results of a prolonged study of a large number of species of seeds are given, a preliminary account of some of the experiments having already been noted (E. S. R., 18, p. 330).

The author found that the integument of some seeds after a certain amount of drying became impermeable, so that the seeds exhibited no swelling even after a lapse of two years. Under the prolonged action of water or water vapor the integument of most seeds becomes permeable, allowing gases to comply with the usual laws of diffusion. Alcohol, ether, chloroform, and acids had no effect on the vitality of seeds so long as the seed coats remained impermeable. When subjected to the extremely low temperatures of liquid air the influence of this medium was proportional to the amount of water in the seeds. Tests of old seeds showed that they did not retain their vitality indefinitely.

The gaseous exchange in seeds kept in the dark for a month or two was reduced to a minimum. On the contrary, it was considerably increased in seeds kept in the light. The permeability of the seed coats and the proportion of dehydration of the seed was also found to influence it. The exchange of gases in latent seeds is said to be due to simple chemical oxidation, and it can be entirely suspended for a time without destroying the germinative power of the seed. The dehydration of the seed was found essential to prolonged vitality.

The author was unable to determine whether anaerobic life in seeds is due to an actual suspension of the power of assimilation on the part of the protoplasm or whether the protoplasm and nucleus of the cell are nourished by the reserve material and the phenomena of life carried on, but in a very greatly reduced degree.

A bibliography of more than 100 references to the literature of the subject is appended.

The variations in the intensity of respiration and of dry substance of flowers during their development, A. Maige (*Bul. Soc. Bot. France, 53 (1906), pp. XLVI-XLVIII*).—The results of experiments with 21 species of plants that bloomed in September at Fontainebleau and in December at Algiers are given. In every case four lots of flowers in different stages of development were weighed and then placed in flasks containing definite amounts of air. From time to time the air was sampled and the amount of carbon dioxid determined. Knowing the dry weight per gram of fresh material and the respiratory quotient of the fresh flowers, the proportion between the respiration and dry weight was readily calculated.

It was found that for the flowers of most plants the ratio between fresh weight and carbon dioxid liberated decreased regularly as the flowers grew and expanded. For a few plants the intensity of respiration was greatest in the expanded flowers. The same conclusions were arrived at where the dry weight was considered. The respiration of the individual flower almost always increased from the youngest stages to the open flower. For the most part the dry weight per gram of fresh material in the flower decreased with the increased development, the rate varying with the different species.

Heredity and Mendel's law, C. B. Davenport (*Proc. Wash. Acad. Sci., 9 (1907), pp. 179-187*).—This is an address delivered by the author under the auspices of the Washington Academy of Sciences in which he discusses those changes in the germ-plasm due to combinations of two dissimilar sorts and the effect of such combinations on the stream of germ-plasm that issues from the union, the illustrations being drawn from the author's experiments with fowls.

Mendelism and other methods of descent, O. F. Cook (*Proc. Wash. Acad. Sci., 9 (1907), pp. 189-240*).—This is a discussion of Mendelism and other methods of descent, the paper being an amplification of an outline presented by the author before the Washington Academy of Sciences on February 26, 1907.

International catalogue of scientific literature. R—Bacteriology (*Internat. Cat. Sci. Lit., 5 (1907), pp. VIII+837*).—The present volume is in continuation of the series previously described (E. S. R., 14, p. 1049) and is intended to cover the bacteriological literature of 1905 with such articles appearing in 1901-1904 as were omitted in previous issues. The arrangement is by authors and subjects, over 6,000 titles being given.

There are a number of titles of papers that would hardly be looked for in this publication, and the inclusion of lists of Agaricaceæ, Ustilaginaceæ, and titles relating to diseases of plants that are due to some of the higher fungi can hardly be justified. The American bacteriological literature is almost wholly neglected. Only about 50 titles are given of papers published in this country, and most of those are from 2 or 3 sources only. The work of this Department and of the State experiment stations appears to have been neglected entirely.

FIELD CROPS.

The breeding of agricultural plants, C. Fruwirth (*Die Züchtung der Landwirtschaftlichen Kulturpflanzen. Berlin, 1907, pp. XV+380, figs. 30*).—Previous volumes of this work have already been noted (E. S. R., 17, p. 1055). This volume, the fourth of the series, treats of the breeding of wheat, rye, barley, oats, and sugar beets. In its preparation E. von Proskowetz, E. von Tschermak, and H. Briem were associated with the author and the work was so divided that the subject of blossoming and pollination in cereals and the sugar beet are discussed by Fruwirth, correlations in the cereals by von Tschermak, correlations in the sugar beet by von Proskowetz, the technic of breeding cereals with the exclusion of hybridization by Fruwirth, the technic in breeding sugar beets by Briem and von Proskowetz, and the hybridization of the cereals and the sugar beet by von Tschermak. The volume contains a number of bibliographies relating to the different subjects treated.

Campbell's soil culture manual, H. W. Campbell (*Lincoln, Nebr., 1907, pp. 320, pl. 1, figs. 52*).—This book, a farmers' guide adapted to semiarid regions, describes the different implements used in dry farming, discusses the value and methods of soil treatment to conserve soil moisture, and gives directions for growing the ordinary farm crops under semiarid conditions without irrigation. Special attention is given to corn, wheat, potatoes, sugar beets, alfalfa, and tree culture.

Proceedings of the trans-Missouri dry farming congress (*Proc. Trans-Missouri Dry Farming Cong., 1907, pp. 248*).—A collection of the different papers presented at this congress held at Denver, January 24–26, 1907, together with the discussions on different phases of farming in the semiarid regions without irrigation.

Report of work at McNeill branch experiment station for 1906, E. B. Ferris (*Mississippi Sta. Bul. 101, pp. 1–4; 11–20, figs. 2*).—General statements with reference to the year's work at the station are given. As in previous years fertilizer tests were made with a number of crops.

In experiments with cotton, in which as a rule cotton-seed meal, acid phosphate, and kainit were applied at the rate of 100 lbs. each per acre in different combinations, the best yield, 1,060 lbs. of seed cotton per acre, was secured from the use of acid phosphate and cotton-seed meal. In another test conducted to determine whether the addition of kainit to cotton-seed meal and acid phosphate would increase the yield, the use of acid phosphate and cotton-seed meal gave 1,540 lbs., while the application containing 100 lbs. of kainit in addition gave only 1,485 lbs. of seed cotton per acre. The effects of manure left by cattle in the winter of 1902–3 was still quite perceptible this year. The yields of different varieties of cotton compared ranged from 975 lbs. to 1,385 lbs. of seed cotton per acre. The leading sorts and their yields were as follows: Cook Improved 1,385 lbs., Culpepper 1,300 lbs., Cleveland Big Boll 1,265 lbs., Hunnicutt Big Boll 1,260 lbs., Toole Improved 1,245 lbs., Rogers 1,220 lbs., and Florodora 1,210 lbs.

The average yields of corn per acre in the fertilizer tests ranged from 14.6 bu. on the plat receiving no fertilizer, to 28.6 bu. on the plat receiving 100 lbs. each of cotton-seed meal, acid phosphate, and kainit. The lowest yield on any fertilized plat, 18.6 bu., was secured where 100 lbs. of kainit was applied alone. The plat given 100 lbs. acid phosphate alone ranked second in yield with 28.3 bu. On parked land receiving 100 lbs. each of acid phosphate and cotton-seed meal 36.5 bu. was secured, and only 33.3 bu. when in addition 100 lbs. of kainit was given. The leading varieties of corn and their yields per acre were as follows: Cocke Prolific 35.3 bu., Eureka 35.1 bu., Mosby Prolific 32.8 bu., and Early Breadfield 32 bu.

Oats and vetch, sown in the proportion of 4 to 1 on land fertilized with a light application of stable manure and 400 lbs. per acre of a mixture of equal parts of acid phosphate and cotton-seed meal, were cut on April 30 and produced 6,090 lbs. of well cured hay per acre. The land then produced a crop of 30 bu. of Mosby Prolific corn and a fair crop of cowpeas for turning under in the fall. Brief cultural notes on different forage crops are given.

The best average yield of plant cane, 30,050 lbs. per acre, was secured where 400 lbs. of cotton-seed meal and 200 lbs. of acid phosphate had been applied. The check plat produced 31,245 lbs. In experiments with stubble cane a mixture containing 210 lbs. each of cotton-seed meal and acid phosphate and 90 lbs. of kainit was taken as a unit application and gave a yield per acre of 33,856 lbs. of cane. Where the acid phosphate was doubled 41,536 lbs. was obtained, and where the unit application was doubled, one-half being applied on May 16 and the other half on July 10, 41,984 lbs. of cane was secured. Applying double the unit application on May 16 gave 40,896 lbs., and when cotton-seed meal and acid phosphate were normal and the kainit omitted the yield was 33,920 lbs. Half the unit application gave 33,856 lbs., and four times the unit application 45,312 lbs., while the land receiving no fertilizer produced 31,744 lbs. Land on which the nitrogen application was doubled and the phosphorus and potassium left normal gave 36,032 lbs.

Land receiving no fertilizer yielded 13,550 lbs. of sweet potatoes per acre, and the best yield on fertilized land, 15,910 lbs., was secured where 150 lbs. each of cotton-seed meal, acid phosphate, and kainit had been given.

Three tests were made to show the effect of fertilizers on cowpeas, and the best yield, consisting of 1,330 lbs. of peas in the hull and 820 lbs. of hay per acre, was secured where a mixture of 200 lbs. each of acid phosphate and kainit was applied. The use of fertilizers apparently affected the yield of peas more than the yield of hay. Some of the leading hay-producing varieties and their yields per acre were as follows: Wonderful 4,200 lbs., Red Ripper 3,504 lbs., Iron 3,329 lbs., and Clay 3,043 lbs.

The results of an experiment in which the rotation of crops and the use of fertilizers were combined showed an increase of 17 per cent in the productive capacity of the soil after 3 years, while land growing cotton continuously showed a reduction in its productive capacity of 16 per cent. It was further found that the use of fertilizers is necessary on this soil for the satisfactory growth of cowpeas in the rotation.

Annual report of the Hawaii Agricultural Experiment Station for 1906 [Field crops], J. G. SMITH (*Hawaii Sta. Rpt. 1906, pp. 10-15*).—Potatoes grown at the station were severely attacked by a form of rot which very much reduced the yield. The crop secured was disposed of as new potatoes at 5 cts. per pound.

The yield of upland varieties of cotton tested at the station was not specially promising, but Peruvian and Sea Island cotton were for the most part good in quality and gave a large yield. The quality of the Peruvian, however, varied widely, and this is considered as indicating an excellent opportunity for improvement by selection.

Experiments have been inaugurated with tobacco at Hamakua. The tobaccos under test are Sumatra, Turkish, Cuban, and various seed-leaf strains from Connecticut, Pennsylvania, and other tobacco-producing States. The experiment was not quite complete when the report was made, but the results are regarded as indicating that tobacco of good burn, texture, flavor, and color can be produced on a commercial scale in certain districts in Hawaii.

Through the cooperation of the Bureau of Plant Industry of this Department 150 varieties of rice were obtained from different parts of the world for comparison with local varieties. This work has been undertaken with a view to assist in the restoration of rice growing to its former important position in the islands.

[Report on field crops], G. H. TRUE (*Nevada Sta. Rpt. 1906, pp. 27-29*).—Plowing up, leveling, and reseeding old alfalfa ground at the station has given good results. Three acres reseeded in 1904, which in previous years had not yielded over 1.5 tons per acre, gave a total yield in 1905 of 7.9 tons.

The results of the flooding method of irrigating wheat and oats proved more economical than those of the furrow method. White Australian wheat was grown in this test. One-half acre of this variety planted in the fall and irrigated but once in the spring yielded at the rate of 2,376 lbs. of grain per acre. A yield of 2,763 lbs. of grain was produced per acre foot of water.

In a culture test with root crops 1 acre of the long red mangel produced 15.8 tons.

Results of cooperative experiments in agriculture, J. Buchanan (*Ann. Rpt. Ontario Agr. and Expt. Union, 28 (1906), pp. 13–27*).—Earlier results of this work have been previously reported (E. S. R., 18, p. 27).

In the cooperative experiments of 1906 the leading varieties of grain crops gave the following average yields per acre: Siberian oats, 104 tests, 51.18 bu.; Mandscheuri Six-rowed barley, 57 tests, 37.95 bu.; Two-rowed Canadian barley, 3 tests, 23.88 bu.; Guy Mayle Hulless barley, 14 tests, 22.19 bu.; Wild Goose spring wheat, 23 tests, 24.19 bu.; Common emmer, 11 tests, 39.46 bu.; Red spelt as compared with emmer, 27.64 bu.; Japanese buckwheat, 3 tests, 27.78 bu.; Early Britain field peas, 55 tests, 23.79 bu.; White Wonder field beans, 17 tests, 20.05 bu.; Early Yellow soy beans, 1 test, 16.33 bu.; Banatka winter wheat, 17 tests, 30.01 bu.; Compton Early corn, 16 tests, 60.16 bu. The best and most popular mixture of grains consisted of 34 lbs. of Daubeney oats and 48 lbs. of Mandscheuri barley per acre, which produced on the average in 12 tests 1,505 lbs. of grain per acre. In all cases except two the varieties here mentioned ranked first in popularity, Mandscheuri barley and Early Britain field peas being the exception.

The leading varieties of field roots and fodder crops gave the following yields per acre: Yellow Leviathan mangels, 7 tests, 42.66 tons; Giant White Feeding sugar beets, 7 tests, 39.13 tons; Sutton Magnum Bonum swedes, 6 tests, 20.83 tons; Mastodon White Intermediate carrots, 5 tests, 18.26 tons; Buckbee New Sugar parsnips as compared with carrots, 14.79 tons; Henderson Eureka fodder corn, 4 tests, 16.75 tons; Japanese Barnyard millet, 5 tests, 12.03 tons; Kafir corn, 1 test, 9.80 tons; Early Minnesota sugar cane as compared with Kafir corn, 9.24 tons; Dwarf Bonanza rape, 1 test, 25.48 tons. In 3 tests hairy vetches, grass peas, and common vetches gave 7.87, 7.31, and 6.75 tons per acre, respectively. Nearly all these varieties were the most popular with the experimenters, excepting Mastodon White Intermediate carrot and Henderson Eureka fodder corn, which were outranked by Bruce Mammoth Intermediate carrot and White Cap Yellow Dent fodder corn, respectively. Grass peas and common vetches were preferred to hairy vetches. Mangel seed sown on the level produced a yield of 33.3 tons of roots per acre as compared with 30.7 tons where the seed was sown in drills.

Ringleader, Golden Bantam, and Mammoth White Cory sweet corn, requiring 70, 73, and 74 days, respectively, to mature for table use, were grown in 20 tests. In comparative value, Ringleader and Mammoth White Cory outranked Golden Bantam, which stood first in table quality.

In the fertilizer experiments conducted in the previous years the greatest average yield of oats for 5 years in 74 tests was secured by the use of the complete fertilizer, while the greatest average yield of mangels for 5 years in 41 tests was obtained where nitrate of soda was applied. The total yield of fodder corn for 8 years in 47 tests was the same from the use of nitrate of soda, the complete fertilizer, and of muriate of potash, but the yield of husked ears was slightly in favor of the complete fertilizer. The highest average yield of swedes for 4 years in 12 tests, 30.1 tons per acre, was secured where 40,000 lbs. of cow manure was applied per acre.

The average yields of 3 late varieties of potatoes, Empire State, Dempsy Seedling, and American Wonder, grown in 86 tests, were, respectively, 174.67, 168.49, and 165.80 bu. per acre. Of 3 medium varieties, grown in 70 tests, Rose of the North ranked first, Burpee Extra Early second, and Seedling No. 230 last. Rose of the North, which produced 164.36 bu. per acre, also ranked first in comparative value. The leading early variety was Early Dawn, which ranked first in yield and comparative value in 144 trials.

[Notes on alfalfa and sugar beets], P. K. BLINN (*Colorado Sta. Bul. 121, pp. 1–6, figs. 4*).—Brief comments on the alfalfa seed nursery established in 1905, and on the work of developing a disease-resistant sugar beet are presented. The characteristics of a number of individual alfalfa plants are noted, and some of the points observed in the sugar-beet work are summarized. These notes are intended as a report of progress.

The work of selecting mother beets for growing seed has pointed out the wide variation of the seed-producing tendency of individuals and has demonstrated that the seed yield can be materially influenced. It was found that a large number of beets would not grow a seed stock and that uniform seed production depends largely upon the proper soil conditions and the manner of setting out the beets. Well-matured beets of good shape and size are selected, the leaves removed without injury to the center or crown buds, layered in dry soil in deep, narrow ventilated pits protected from frost, and set out early in April for seed production.

Alfalfa, P. G. HOLDEN (*Iowa Sta. Circ. 1, pp. 4*).—Popular directions for alfalfa culture are given and the advantages and disadvantages of the crop are pointed out. The points emphasized are "the manuring of the ground before plowing, removing the small grain and preparing just as soon as possible after the small grain has been harvested, thorough preparation of the ground, and sowing not later than August 10 to 20, and beginning on a small scale."

The nitrogen content of barley in its relation to the structure of the meal in the kernel, E. JALOWETZ (*Abs. in Zentbl. Agr. Chem., 36 (1907), No. 4, pp. 229–232*).—The formalin method of treatment was used in testing the relative mealiness and hardness of the kernels.

Barley grains were soaked for 30 minutes in commercial formalin at the boiling point of water. After this treatment they were washed 4 or 5 times with cold well water and dried between filter papers for the purpose of removing the formalin solution. As grains from the upper half of the head are known to be richer in nitrogen than those from the lower half, samples were prepared to determine the effect of this treatment on the grains from the two parts. The dissolution of the lower kernels was effected more readily than that of the grains taken from the upper part. The action of the formalin was best observed in grains containing from 1.6 to 1.8 per cent of nitrogen.

On account of their higher nitrogen content the grains from the upper part of the head differ in structure from those produced in the lower portion of the spike, this difference being manifested by hardness and glassiness. Attention is called to the fact that with all grains mealy, or nearly so, the barley is low in nitrogen, while if the kernels are glassy and hard the barley is high in nitrogen content. If a sample after formalin treatment shows both mealy and glassy grains it is evidence that the barley is composed of some kernels low and others high in nitrogen. An analysis showed that the mealy kernels contained 1.16 per cent nitrogen, half glassy kernels 1.59 per cent, and glassy kernels 1.70 per cent.

On the physiological effects of an excess of magnesia upon barley, S. KUMAKIRA (*Bul. Col. Agr. Tokyo Imp. Univ., 7 (1907), No. 3, pp. 441, 442*).—Six pots holding 8 kg. of loamy humus soil, containing 0.5 per cent CaO and 0.4 per cent MgO soluble in 10 per cent solution of hydrochloric acid, were fertilized with double superphosphate, sodium nitrate, ammonium sulphate, and potassium sulphate. Twenty-five grains of barley were sown in each pot

Nov. 28, and the young plants a month later reduced to 15 of equal size per pot. Two check pots received no further addition, 2 received 10 gm. of crystallized magnesium sulphate in high dilution, and 2 received each 50 gm. of the same salt.

It was found that an excess of magnesia over lime retarded growth and maturity in proportion to the amount of magnesia in excess. A moderate excess of this substance did not diminish the number of shoots, but a large excess reduced the number of stalks developed by the plant. It was also shown that large quantities of magnesia in the soil diminished the strength of the leaf sheath and of the stalks.

Indian corn, A. M. TEN EYCK and V. M. SHOESMITH (*Kansas Sta. Bul. 147, pp. 225–295, figs. 26*).—The experiments reported have as a rule been in progress from 1903 to 1906, inclusive. Of 112 varieties tested during this time, Hildreth, Kansas Sunflower, McAuley, Forsythe Favorite, Golden Row, Hammett, Leaming, U. S. P. B. Selection No. 77, Hogue Yellow Dent, Sanders Improved, White Salamander, Red Cob White Dent, White Injun, Legal Tender, Warner, Mammoth Golden Yellow, Dyche, Meinhardt, and Hiawatha Yellow Dent were superior in productiveness. From 121 to 143 days, with an average of 129 days, were required to mature corn in 1905. Of the better yielding varieties grown for the 4 years, 16 maturing in 126 days or less produced on an average 61.45 bu. per acre, while 19 ripening in 127 days or more yielded 64.94 bu. per acre.

For the 4 years listing early in the spring and splitting the ridges at planting time gave an average increase of 5.02 bu. per acre over giving no early cultivation. Early listing produced better results and also conserved more water in the soil than early disking. Surface-planted corn yielded on an average 6.65 bu. more corn and 469 lbs. more stover per acre than listed corn. The wet seasons favored surface planting and the dry seasons listing. A test of different methods of planting in 1905 resulted in a yield per acre of 53.24 bu. for surface planting with the disk furrow-opener attachment, 51.94 bu. for ordinary surface planting, and 48.33 bu. for listing.

Soil moisture studies in this connection showed without exception that as compared with surface planting listing favored the conservation of soil moisture in the latter part of the season. This is considered as due possibly to the roots lying relatively deeper in the soil and allowing for somewhat deeper cultivation, but also to the fact that the listed corn was laid by with level cultivation while the surface-planted corn was slightly hilled. During 2 seasons the largest average yields were secured by planting May 26, and the results in general apparently favor rather late planting as compared with early planting. The difference in results from various methods of cultivating corn was not sufficient for very definite conclusions. It appeared that the exact method of cultivation, whether deep or shallow, was not of so great importance as the conditions of soil or season as related to the proper time of cultivation. The soil moisture determinations showed no marked variation on the several plats.

In the comparative fertilizer tests in 1906 the largest yield, 56.63 bu. per acre, was secured on land treated with barnyard manure at the rate of 13 tons per acre. The next largest yield, 40 bu. per acre, was obtained on the plat treated with 50 lbs. of nitrate of soda applied broadcast. The average production of the unfertilized land was 33.21 bu. per acre.

The results of rotation tests for 4 years were as follows: Corn after potatoes, 69.98 bu. per acre, after soy beans, 67.55 bu., and after corn, 60.74 bu., while after wheat, barley, oats, and emmer the yields were smaller than where corn was grown after corn, but the lowest yields were produced after Kafir and sorghum. In value of total products in 4 years the rotation of corn with potatoes ranked first with $43.47 per acre; corn after Kafir corn, second, with $34.46 per acre; corn after sorghum, third, with $31.15, and corn continuously, fourth, with $31.07.

A summary of the results of shrinkage experiments carried on for 3 seasons shows a loss in weight of 3.26 per cent for the first 4 months after the corn was placed in the crib, 5.16 per cent for the first 6 months, 6.80 per cent for the first 8 months, 7.44 per cent for the first 10 months, and 8.62 per cent for the first year. The average shrinkage of yellow corn was 11.21 per cent in 12 months, of white corn 8.48 per cent, and of mixed corn or samples of many varieties only 6.18 per cent. It is considered that the average result of the shrinkage trials indicates that corn cribbed fairly dry and in good condition should not shrink over 5 per cent during the winter months. Attention is called to the fact, however, that in these experiments great care was exercised to prevent loss from other causes.

The corn-breeding work of the station is described. It was found that in some tests there was a difference of more than 400 per cent in the yields from different ear rows. In 1906, the Silvermine high-yielding-rows seed plat yielded 32 per cent more corn and 24.8 per cent more first-grade seed ears than the plat planted with first-grade seed. The Hildreth high-yielding-rows seed plat yielded 10.36 per cent more corn and 40 per cent more first-grade seed ears than the plat planted with first-grade seed of this variety. It is pointed out that the results of the breeding work show that the individuality of certain ears can be utilized in the improvement of a particular breed or variety. The breeding stock of Kansas Sunflower corn, after 4 years breeding by the station, traces back to 2 original mother ears.

Germination tests indicated that ears of corn may vary greatly in vitality, regardless of proper selection and preservation, and that it, therefore, is very important that each ear of seed corn be subjected to a germination test in order to remove those of low vitality.

Protein in seed corn, C. L. Penny (*Delaware Sta. Rpt. 1904–1906, pp. 13–33*).—Samples of seed corn were analyzed for the purpose of selective propagation. The percentages relate to the air-dry state after the corn had been kept over winter under the usual conditions.

For 59 crops grown in 4 different years the average of protein was 9.19 per cent, while the average for 50 crops grown from local seed was 9.14 per cent. With the exception of a few samples of shelled corn received from the West, which averaged 12.78 per cent protein, the highest percentage of protein was found in a Delaware crop, this being 11.22 per cent as an average of 36 ears chosen by the grower for physical perfection alone. The range in these ears was from 9.75 to 13 per cent, the best being about one-third better than the poorest. In another crop the range was from 6.25 to 12.69 per cent, the one being twice as rich as the other. The smaller kernels at the end of the ear were found to contain on an average 0.30 per cent less protein than the large and full-formed kernels. The results of the different crops are recorded in tables.

The value of cotton improvement (*Oklahoma Sta. Circ. 7, pp. 4*).—A popular discussion on the subject, mainly devoted to ways and methods of increasing the yield per acre.

Lupines as an intercultural crop for green manuring with potatoes, Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz., n. ser., 5 (1907), No. 6, pp. 63–66, fig. 1*).—This article describes the growing of yellow lupines between the rows of potatoes for the purpose of soil improvement.

Rice culture, J. BOONACKER and A. W. DROST (*Inspectie Landb. West-Indië Bul. 8, pp. 35*).—This bulletin contains a description of rice culture in Surinam. Statistics of the industry are presented, the profits of rice growing given, and the methods of culture discussed.

On the continuous application of manganous chlorid in rice culture, II, K. ASO (*Bul. Col. Agr. Tokyo Imp. Univ., 7 (1907), No. 3, pp. 449–453*).—Earlier results in this line of work have been previously reported (E. S. R., 16, p. 42).

The data secured showed that liming increased the yield by 19 per cent. The manure and fertilizer application, increased by 33 per cent, gave an increase of 24.8 per cent in total yield. On the manganese plats the increase was relatively greatest when manuring conditions were the least favorable, the increase in total yield being 23.5 per cent. On the limed plats the manganese gave an increase of only 4.4 per cent. in total yield. On the heavily manured plat the manganese exerted no influence on the total production, but there was relatively more straw produced on the check plat than on the manganese plat. In the different years the increase in total yield through the action of manganese has varied from zero on the heavily manured plats of 1906 to 41.8 per cent in 1903.

The growth of sugar beet in the midlands, J. GOLDING and H. B. HUTCHINSON (*Abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 10, pp. 512, 513*).—The results of cooperative experiments with sugar beets, which are here tabulated and discussed, indicate that complete commercial fertilizers while they maintain the quality also tend to increase the total yield of sugar per acre. Of the 4 varieties tested, Kleinwanzleben Original gave the highest yield of sugar. Stiff to medium loam soils proved most suitable to the crop, while bog soil was unsuitable. The best distance for planting in the rows was 12 to 16 in.

The progress in the beet-sugar industry during 1906, O. FALLADA (*Österr. Chem. Ztg., 10 (1907), No. 12, pp. 161–164*).—This article summarizes briefly the results of cultural and other agricultural experiments with sugar beets, of chemical studies and analytical methods of investigation, and of improvements in factory practices.

Sugar-cane experiments in the Leeward Islands, F. WATTS ET AL. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1905–6, pt. 1, pp. 73*).—Descriptions of the varieties of sugar cane under test, together with the results secured, are given in tables. The experiments which have been in progress for several years are conducted on 8 estates in Antigua and 8 in St. Kitts. The total area occupied in both islands is 96 acres.

In Antigua the results with plant canes show that B.156, D.109, Sealy Seedling, B.208, B.376, Queensland Creole, and B.393 stand out as especially worthy of attention. Some of these canes have been mentioned in previous reports and B.208 and Sealy Seedling are recommended for fairly extensive planting. D.109, Sealy Seedling, and B.156 have also given best results as rattoons, the first cane possessing the rattooning power in a high degree.

In St. Kitts B.254 heads the list of averages with 8,072 lbs. of sucrose per acre. B.208, Sealy Seedling, D.109, and D.116 are recommended for trial by planters. The best results as rattoons were secured from White Transparent, D.95, and D.74.

Winter wheat varieties, J. H. BARRON (*Pennsylvania Sta. Bul. 82, pp. 19, figs. 8*).—The results of these experiments, which have been in progress for a series of years, indicate that there is no relation between straw yield and grain yield in wheat, that no single variety can be pointed out as the best, and that no specific date for sowing wheat can be given.

In 1906 Rural New Yorker No. 6 produced the smallest yield, an average of 28.91 bu. per acre, and Royal Red Clawson the largest, an average of 38.38 bu. per acre. The average yield of all varieties tested was 33.25 bu. per acre, the average yield of the smooth varieties 33.08 bu., and of the bearded varieties 33.59 bu. per acre. The average weight of all varieties was 60.75 lbs. per bushel, of the smooth varieties 60.43 lbs., and of the bearded 61.37 lbs. The average yield of straw per acre for each variety was 3,024 lbs.

In 1907 Dawson Golden Chaff ranked first with 38.23 bu. per acre and Martin Amber last with 26.26 bu. The average yield for all varieties was 31.35 bu. The smooth varieties gave an average yield of 32.19 bu. per acre and the bearded 29.68 bu. The average weight per bushel of all varieties was 62.65 lbs. The smooth varieties weighed 62.29 lbs., and the bearded 63.37 lbs. to the bushel. The average yield of straw for each variety this year was 4,342 lbs. per acre.

Judging from long year averages, which are considered best for determining variety qualities, Fulcaster, China, Royal Red Clawson, Reliable, and Dawson Golden Chaff have given the best results under conditions existing on the station farm.

The effect of shade during ripening on the proximate constituents of the wheat kernel, R. W. Thatcher and H. R. Watkins (*Jour. Amer. Chem. Soc., 29 (1907), No. 5, pp. 764–767*).—Analyses of wheat from shaded and unshaded plats showed that neither the moisture content nor the ash content was regularly affected. In 5 out of 6 cases the protein content of the shaded grain was higher. The starch content was decreased and the oil or ether extract slightly increased by shading, though this increase was very small.

"From this it appears that significant effects upon the percentage of protein and of starch in the kernels were produced by shutting off the direct rays of sunlight from the plants during the last 10 or 12 days of the ripening period. A careful study of the figures fails to reveal any exact relation between the decreased percentage of starch and the increased proportion of nitrogenous bodies. Hence it appears that the increase in the percentage of crude protein is not due simply to the failure of the plant to build up its normal amount of starch, but to some disturbance of the physiological processes caused by the absence of direct sunlight."

Dodder in relation to farm seeds, F. H. Hillman (*U. S. Dept. Agr., Farmers' Bul. 306, pp. 27, figs. 10*).—This bulletin discusses the importance of dodder as an impurity in seeds, describes the character of dodder plants, the various kinds of dodder and the kinds of seeds infested with it, points out the relation of dodder to the seed trade, and gives advice for buying seed and directions for cleaning the same.

Descriptions of the following dodder seeds are given: Flax dodder (*Cuscuta epilinum*), clover dodder (*C. epithymum*), small-seeded alfalfa dodder (*C. planiflora*), field dodder (*C. arvensis*), large-seeded alfalfa dodder (*C. indecora*), and Chilean dodder (*C. racemosa chilcana*).

HORTICULTURE.

Fruits and vegetables, E. B. Ferris (*Mississippi Sta. Bul. 101, pp. 4–11, fig. 1*).—The work at the McNeill substation with fruits and vegetables was continued along the lines of previous years (E. S. R., 18, p. 1127). Data are given in this report relative to the use of various combinations of fertilizers and marketing experiments with strawberries, asparagus, cabbage, Irish potatoes, and tomatoes.

With strawberries, 200 lbs. of cotton-seed meal, 200 lbs. of acid phosphate, and 100 lbs. of kainit were used as the unit application per acre as in the previous year. With this formula the yield of berries was 2,440 qts. per acre. When the cotton-seed meal and kainit were reduced one-half, the acid phosphate remaining as before, the yield was only 1,950 qts. per acre. Other combinations gave slight variations. The check plat yielded at the rate of 2,205 qts. per acre. The marketing of strawberries, principally at near-by cities, continues to be profitable. There were sold 199.5 24-qt. cases, which brought the shippers net returns of $426.25.

The fertilizer work with peaches was continued, but owing to the late spring freeze no satisfactory results were obtained. Owing to an outbreak of the San José scale all the trees in the variety orchard and in a commercial orchard planted to Greensboro peaches have been dug up and burned.

In the test with asparagus, nitrate of soda was used in the place of cotton seed. A mixture of 250 lbs. of cotton-seed meal, 125 lbs. of nitrate of soda, 405 lbs. of acid phosphate, and 170 lbs. of kainit was taken as the unit application per acre, and this formula gave a calculated yield of 1,396 lbs. of marketable asparagus per acre. When this formula was changed by either cutting down or omitting any of the ingredients, as well as when the unit application was doubled, the yield per acre was reduced. The check plat gave 952 lbs. per acre. It is thought that 1 row of the plat where the unit formula was used was favorably affected by manure applied to neighboring rose bushes. From the entire acreage devoted to this crop, 49½ boxes or 990 bunches were sold, netting $93.35. Chicago proved to be the best market.

The data secured with cabbage are also given, but the yields were unsatisfactory owing to the diseased condition of the plants, and the crop from the fertilized plats proved useless for market purposes. In addition to the plats included in the fertilizer test, an acre of land fertilized with 1,500 lbs. of decomposed cotton seed applied in the drill and listed upon, together with a mixture of 2 parts of acid phosphate and 1 part of cotton-seed meal applied at the rate of 1,000 lbs. per acre on top of the list and harrowed in, was planted with Jersey Wakefield cabbage on February 13. The plants were subsequently given two top dressings of nitrate of soda at the rate of 50 lbs. per acre each, and a fair yield of first-class heads was secured. Sixty-four crates netted $119.80, but the remaining 26 crates netted only $4.05 as they reached the market in poor condition. Some work was done in the fall planting of cabbage. With plants set out September 28, 1905, marketing began January 11, $40 worth of cabbage being sold from 0.22 of an acre. Cabbage set out in the fall of 1906, which survived the unfavorable planting season, made some good heads ready for market at Christmas. When well rooted the plants seemed to stand the lowest winter temperatures without injury, and when planted early in December it is stated that they not only make larger yields but sell for much better prices than when planted in February. The soils are so mellow that young cabbage plants have been successfully covered with dirt and carried through severe cold spells.

In the work with beans a mixture of 225 lbs. of cotton-seed meal, 112 lbs. of nitrate of soda, 456 lbs. of acid phosphate, and 200 lbs. of kainit per acre gave a calculated yield per acre of 130.6 bu. of beans on natural or unparked soil, and of 106.6 bu. on the parked area. When the kainit was omitted the results were 124.8 bu. on the natural soil and 118.7 bu. on the parked soil. With the exception of 1 year, beans have not proven a profitable shipping crop.

In the fertilizer test with Irish potatoes all yields are noted as too poor and irregular to be worth reporting. In a variety test, Triumph gave per acre 39.8 bu. of first grade and 3.5 bu. of second grade, Early Rose 100.8 bu. of first grade and 13 bu. of second grade, Burbank 96.8 bu. of first grade and 14.7 bu. of second grade, Peerless 104.5 bu. of first grade and 14.6 bu. of second grade. Triumph potatoes were dug on May 29 and the three other varieties on June 11. The Irish potato has not proven a profitable crop thus far, since the yield under the best conditions is only from 75 to 100 bu. per acre and unless placed on an early market the margin of profit is small.

Three-quarters of an acre of tomatoes was planted principally with the view of determining whether or not the crop can be raised successfully by spraying regularly to keep down black rot. Considerable rot was developed as the season advanced, but an application of Bordeaux mixture checked it almost entirely. One hundred and seventy 4-basket crates netted the shippers $94.67. It is concluded that tomatoes can be grown successfully in that region when spraying is regularly attended to.

Beets, onions, lettuce, and radishes are also said to do well and might be profitable if marketed properly and at the right time. On October 6, 1905, 0.17 of an acre of Egyptian blood turnip beets was sown, from which 27 bu. were sold during the early spring, netting the shippers $15.15.

Report of the horticulturist, C. P. Close (*Delaware Sta. Rpts. 1904–1906, pp. 40–48, 68*).—The principal lines of work conducted for the year 1906 consisted of experiments in apple breeding, comparative tests of spraying materials, fertilizers and cover crops, dipping nursery stock and strawberry plants in insecticides, and the pruning of Kieffer pears. The results of dust and liquid spraying and strong and weak Bordeaux on apples have been previously published (E. S. R., 18, p. 754).

The work in apple breeding is being carried on with the view of originating earlier varieties than those now existing, especally earlier red varieties. Several crosses were made between the well-known early sorts, between several of the winter sorts, and of some of the winter varieties with the early varieties. The methods of procedure are outlined, and the results are tabulated. Of the total number of crosses, 2,288, only 188 set fruit. Out of 871 blossoms bagged for pure breeding none set fruit. The crosses in which early varieties were used as female parents produced 1,129 good plump seeds. Only 1 fruit was secured out of the crosses where the winter varieties were used as female parents. This fruit contained 5 mature seeds. The seeds secured are to be grown to fruiting.

The work with commerical fertilizers and cover crops on apple orchards was continued (E. S. R., 18, p. 1043), but the author states that practically no results of a reliable nature have been obtained, as the cover crops have been too light. Somewhat similar tests have been conducted in a peach orchard, but owing to uncontrollable conditions and the diseased nature of the orchard, as well as to make room for apple trees in the same orchard, it has been decided to discontinue the test and remove the peach trees.

Dipping experiments with nursery stock and strawberries are noted elsewhere in this issue. A brief note is given on the present condition of the Kieffer pear trees with which pruning experiments were begun in 1903 (E. S. R., 18, p. 1043). Although the trees have not thus far produced as much fruit as trees of the same age unpruned, the author is of the opinion that the pruned trees will soon outyield the others.

Summary of investigations [Horticultural crops], J. G. Smith (*Hawaii Sta. Rpt. 1906, pp. 10–12, 14, 15, 17, pls. 2*).—A summary is given of planting operations and cooperative and marketing experiments with horticultural crops.

A tropical fruit orchard, including the mango, avocado, breadfruit, cherimoyer, sapodilla, wi, custard apple, longan, and others, has been planted, together with a nursery of citrus stock to provide material for budding and grafting, and a few acres of coffee and rubber trees. Two hundred cuttings of vanilla placed in a grove of Keawe have rooted nicely and are expected to bear in a year or more. An extensive cooperative experiment with wine grapes is being conducted on the island of Maui, in which 177 varieties are being tested.

Relative to coffee, it is stated that the chief cause of failure in Hawaii is due to economic conditions, as there are no difficulties about growing the crop. While the best grades have always been in demand the low grades can not be produced in competition with Brazil and similar countries, which tends to force the small producer out of business.

The cooperative experiments with cacao and bananas have been continued on the grounds of the Hilo boarding school. The growth of the cacao during the past year is reported as unfavorable, principally due to an unusual drought in a region which usually has abundant rain. Bananas planted for shade have grown well and some varieties have fruited.

Results of marketing experiments with horticultural crops have been previously noted (E. S. R., 19, p. 338).

Report of the horticulturist, J. E. HIGGINS (*Hawaii Sta. Rpt. 1906, pp. 33–36*).—Brief notes are given on the present status of citrus fruits and mangoes in Hawaii, together with some data on the distribution of Bluefields banana, roselle culture, and a partial list of plant accessions made during the year ending June 30, 1906.

Several varieties of lemons, together with superior limes and seedling pomelos are reported as growing in the gardens of Honolulu and other parts of Hawaii. An orange has recently been noted which has a decided tendency toward the navel type and lacks nothing in flavor. It is believed that by multiplying some of the native seedling oranges the fruit can be produced almost the whole year in most localities. A bulletin dealing with the culture of citrus fruits in Hawaii was published in the early part of the year and previously noted (E. S. R., 17, p. 767).

As has been previously noted in a bulletin on the mango in Hawaii (E. S. R., 17, p. 1155), the presence of the mango weevil (*Cryptorhynchus mangiferæ*) is said to be the one serious hindrance to the progress of the industry. A plea is made for more stringent measures to control and destroy this insect. A collection is being made of the finest varieties of mango trees available, and these will be propagated on seedling stock.

Experiments conducted with the roselle show the plant to be well adapted to local conditions. The yield of fruit per acre under average conditions is given as from 6,000 to 7,000 lbs. The fleshy calyx and the seed pod while young and tender are said to make an excellent jam and jelly. While fairly tolerant of dry weather, it is stated that the plant improves and produces more heavily with irrigation. The seed is sown about March, and the plants set in the field when from 6 to 8 in. high. Planting distances recommended are 4 by 6 ft., where either irrigation is to be employed or rainfall is abundant, and about 4 by 4 ft. in dry localities.

Cantaloupes, P. K. BLINN (*Colorado Sta. Bul. 121, pp. 6–8, figs. 3*).—The author has succeeded in developing a cantaloupe with rust-resisting qualities. Seeds were distributed to various sections in the United States, and brief extracts are given from the reports thus far received.

In the majority of cases this melon has given good satisfaction and the fruit and vines have held up long after other varieties were attacked by the rust. A record is also given of the author's trials with this seed during the past season, from which it appears that the rust-resistant selection remained green until the majority of the fields were dead. Some of the most markedly resistant plants in the plat remained green until frost, in spite of the fact that the seed was grown on soil that for 4 consecutive years had been badly infested with rust.

The apparent lateness of the rust-resistant strain of melon is believed to be due to abnormal ripening of the other strains rather than to any real inherent lateness. In order to develop early maturity in the rust-resistant strain, however, arrangements are being made for a cooperative test in which some of the seed will be grown in Canada and the product then tested at Rocky Ford to indicate the influence of latitude on early maturity.

Tomato culture, W. W. Tracy (*New York, 1907, pp. X+150, pl. 1, figs. 43*).—This is a practical treatise on the tomato, including its botany, history, general characteristics, planting, fertilization, cultivaton in garden and greenhouse, harvesting, packing, storing, and marketing. Consideration is also given to the adaptation of varieties for different purposes, and to seed breeding and growing, together with chapters on insect enemies and their control by F. H. Chittenden, and the diseases of tomatoes and their control by W. A. Orton.

A method of propagating fruit trees with special reference to the olive, Dubouloz (*Bul. Off. Gouvt. Gén. Algérie, 13 (1907), No. 15, p. 232*).—The author calls attention to the successful results secured from propagating the olive by what he terms the graft-cutting ("greffe-bouture") method. This method, which is described, appears to be similar to the long scion root-graft method used chiefly with apples in the western part of the United States, in which the grafted scion is planted up to the top bud and eventually forms roots, being nourished in the meantime by the piece of root to which it is grafted.

The cherry in the valley of the Rhone, A. Cadoret (*Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), Nos. 27, pp. 20–25; 28, pp. 42–52, figs. 10; 29, pp. 86–90; 30, pp. 119–123; 31, pp. 142–148*).—Popular directions are given for the cultivation of the cherry with special reference to the development of the industry in the valley of the Rhone. All of the important phases are considered, including soil and climatic conditions, varieties, soil preparation, and planting operations, pruning, fertilizing, enemies of the cherry and their control, harvesting and marketing. Information is also given with regard to yields, financial returns, market conditions, and the various uses of the cherry.

New hybrid plum, A. M. Ragland (*Farm and Ranch, 26 (1907), No. 26, p. 10, fig. 1*).—A description, with illustration, is given of a new hybrid plum said to have originated in the orchard of H. A. Biles, of Roanoke, Tex. This plum, which has been named Bilona, is believed to have originated accidentally through cross-pollination of the Chabot by a wild plum growing in a neighboring forest. It is said to have the form of the Chabot, blooming at the same time, and bearing an immense crop of fruit, which is covered with a crimson blush on a yellow ground and a heavy bloom, characteristic of the Australis, a native wild plum of that section. The tree is said to have an upright and vigorous growth, and the fruit is believed to be equal in quality to the best plums of Americana or Chickasaw strains.

Coffee culture in Hawaii, W. H. Ukers (*Tea and Coffee Trade Jour., 13 (1907), No. 2, pp. 67–75, figs 15*).—A popular account of the coffee industry in Hawaii, including considerable data with regard to the annual yields, value, acreage, average yield, cost of production, and the estimated yield for the islands. The annual output is given as from 24,000 to 30,000 bags exported to the mainland, together with 1,800 to 2,000 bags consumed in the islands. The annual value for the 5 years 1901–1906 ranges from $270,000 to $336,000. The total acreage under cultivation is given as 4,500, the average yield about 650 lbs. per acre, and the average cost of production in 1906 as 7½ cents per pound. The average selling price is 10½ cts. per pound. The text is well illustrated.

Home grown tea, G. F. MITCHELL (*Tea and Coffee Trade Jour., 13 (1907), No. 2, pp. 76–80, figs. 4*).—This is a reproduction of a Farmers' Bulletin on the same subject recently published by the author and noted (E. S. R., 19, p. 240).

Breeding hardy strawberries, N. E. HANSEN and C. HARALSON (*South Dakota Sta. Bul. 103, pp. 218–265, figs. 20*).—In 1894, an experiment was begun at the Iowa Station by the late J. L. Budd, assisted by N. E. Hansen, in improving the wild strawberry of Manitoba by crossing with standard cultivated varieties. The experiment was subsequently dropped, as it was found (E. S. R., 10 p. 47) that although the resulting hybrids were hardy the fruit was too small to compete with standard market varieties. Owing to the general complaint as to the lack of hardiness of standard varieties in the Northwest prairie regions, however, this experiment has been continued and enlarged at the South Dakota Station, with a view to producing varieties perfectly hardy without winter protection of any kind. An account is given of the work conducted at the station along this line.

Native varieties were brought together from different sections in the Northwest and grown with a large number of cultivated varieties with a view of comparing their relative hardiness. Of the cultivated varieties Princess, Warfield, Clyde, Enhance, Van Deman, Bederwood, Bisel, Seaford, and Glen Mary made the best showing in the order named. None of these varieties, however, were as hardy as the native wild strawberry. An attempt has been made to improve the latter both by hybridization and selection.

Out of several thousand hybrid seedlings 225 were saved for further trial and have since been largely reduced in number. Only 2 have been sent out for preliminary trial, South Dakota No. 1 and South Dakota No. 2. Extracts from the reports on these varieties show that they are of promise only where standard varieties suffer from the cold winters. A large number of derivative hybrids have also been made between the primary hybrids and choice cultivated varieties. About 100 primary hybrids, together with 22 of the more promising secondary hybrids are shown in a series of plates with notes on their parentage.

Breeding experiments with the wild strawberry of Alaska have been started, as a result of which several hundred vigorous hybrid seedlings came into bearing this year. The wild Alaska strawberry is larger than the native Northwestern prairie strawberry.

In addition to the work at the station a list is given of commercial varieties grown in the southeastern part of the State, with notes on their value, representing the experience of leading commercial growers in Vermilion, together with notes on varieties and methods of culture in the Black Hills, by F. L. Cook. Introductory remarks deal with how new strawberries are invented, perfect and imperfect strawberry blossoms, pedigree strawberry plants, historical notes on wild American strawberries, origin of our cultivated strawberries, and winter-killing.

Raspberries, blackberries, and dewberries, N. E. HANSEN and C. HARALSON (*South Dakota Sta. Bul. 104, pp. 266–297, figs. 15*).—In this bulletin a series of 15 plates is given illustrating the work in raspberry breeding at the South Dakota Station, in which are shown over 140 seedling varieties that have proven hardy without protection. The text of an address on breeding hardy raspberries for the Northwest, delivered before the American Breeders' Association (E. S. R., 18, p. 940), is reproduced, the classification of raspberries is briefly discussed, and notes are given on a large number of varieties of raspberries, blackberries, and dewberries tested, including hybrid raspberries produced at the station with special reference to hardiness.

In 1906, 325 seedlings, almost all hybrids, were selected from a large plantation of seedling raspberries produced at the station and have been planted for further trial. Several of these seedlings are said to be very large in size and very productive. Extracts are given from a report on the brambles in the Black Hills made by F. L. Cook to the South Dakota State Horticultural Society, in which it is stated in substance that blackberries, black-cap raspberries, and the hybrid raspberries of the Columbian type produce on the average only half a crop and are unprofitable commercially. Of a large number of varieties of red raspberries tested in the same region, Loudon and Marlboro are strongly recommended for planting, having proven for a number of years more than twice as productive as any others. "Dewberries are productive, but only an expert will be able to make them pay for market."

The authors are of the opinion that it is useless to expect anything of value from cultivated varieties of raspberries, blackberries, and dewberries upon the open prairies of the Northwest, and that an attempt must be made to cultivate and improve native forms of these fruits.

Roselle: Its culture and uses, P. J. Wester (*U. S. Dept. Agr., Farmers' Bul. 307, pp. 16, figs. 6*).—This bulletin deals with the history and geographical distribution of the roselle, together with its botanical characters and relationships, varieties, cultivation and fertilization, yield, harvesting, marketing, composition and uses of the fruit and plant, and notes on breeding, fungus diseases, and insect enemies.

The roselle is an annual from the Old World tropics. Its principal use is for the making of jellies, jams, etc., from the calyces of the fruit, although the young stems are also said to make good jelly, and the plant is said to be grown in India for its fiber, which is used in the manufacture of cordage and coarser textile products. On account of its extreme sensitiveness to frost it is here recommended for cultivation for its fruit only in tropical and subtropical countries.

Fruit growers' associations, W. Paddock (*Colorado Sta. Bul. 122, pp. 18*).—In this bulletin the author describes the workings of the fruit associations in Colorado, including all the important phases of organization methods. A list is given of 33 fruit and produce and cantaloupe associations now doing business in the State.

As an example of successful cooperation a brief history is given of the Grand Junction Fruit Growers' Association, which was started in 1891, and is doing the largest business of any in the State, together with a statement of the business transacted in 1906, the by-laws, and the grading list of this association. In 1906 a total of 1,036 cars were shipped. The gross receipts were $814,278.62, and the amount paid growers $555,813.44

FORESTRY.

Investigations on the comparative value of various substances for the preservation of wood, E. Henry (*Bul. Soc. Sci. Nancy, 3. ser., 8 (1907), No. 1, pp. 42–139, pls. 10*).—The author here reports the results of 3 years' experiments at the forest school at Nancy along the above lines, in which a large number of antiseptics were tried on various species of wood used for construction purposes, the object of the experiments being to obtain reliable data for the use of architects, contractors, etc., both with regard to the most efficient and economical preservatives and their method of application.

The author briefly reviews the work of other investigators, after which his experiments, together with the results secured, are discussed in detail. The treated wood has been tested for the 3 years under various conditions, both in the open air and under cover, in contact with soil, garden compost, stable manure, and on planks infected with fungus diseases. Although the present experiments are not considered complete and are to be continued for several years, the results so far indicate that the carbolineum preparations, as well as microsol, are the best preservatives to use. Gas tar also proved quite efficient, but antinnonine, antigermine, lysol, and hydrofluoric acid were of little value. Microsol is believed to be more adapted for the preservation of wood used for interior work, since it neither stains the wood nor gives off an unpleasant odor.

Descriptions are given of a large number of fungus diseases and insect pests attacking wood, together with suggestions for their control, and a bibliography of important literature on this subject.

The comparative durability of oak and beech railroad ties is discussed. The creosoted beech is said to be more durable even than the heartwood of the creosoted oak. Consideration is also given to the methods of application, the qualities of a good antiseptic and the facility of impregnation of various hardwoods and conifers with carbolineum avenarius, with special attention to the beech both on account of its abundance and importance as a commercial wood, and because of its proneness to decay when untreated.

The text is accompanied by several plates showing the effect of various preservatives on the wood treated.

The article concludes with a contribution by M. Mer on the value of barking or ringing trees some time previous to cutting in order to prevent decay. Experimental work along this line is noted to show that barking the tree renders the sapwood more durable and less subject to fungus attack.

The strength of wood as influenced by moisture, H. D. Tiemann (*U. S. Dept. Agr., Forest Serv. Circ. 108, pp. 42, figs. 6*).—In order to secure data with regard to the physical effects of moisture upon woods, an investigation has been conducted at the Yale Forest School laboratory during the past 3 years in which several thousand mechanical tests were made on specially prepared material. The principal species tested were longleaf pine, red spruce, and chestnut. The main tests were made in compression parallel to the grain, bending, shearing, and compression at right angles to the grain. The methods of conducting the tests, together with the principal results secured, have been previously described (E. S. R., 18, p. 743).

The present circular contains a summarized statement of the results obtained both with the species above named and with subsequent tests upon loblolly pine, red gum, Douglas fir, Norway pine, and tamarack. The results are further explained by numerous tables and graphical diagrams. Among the phases here considered are the fiber-saturation point, a summary of moisture-strength relations, shrinkage, effect of casehardening, effect of the process of drying upon wood, and effect of superheating. The equation for the moisture-density-strength relation for longleaf pine, as well as numerous moisture-strength reduction tables for the various species tested, are also given.

Observations on the influence of frost on the diameter of living trees, J. Friedrich (*Centbl. Gesam. Forstw., 33 (1907), No. 5, pp. 185–192*).—The author has conducted investigations for a great many years concerning the influence of weather and climate on tree growth. The reports on this subject, published in 1897, have been noted (E. S. R., 9, p. 562).

In the present report a brief account is given of the author's investigations on the influence of frost upon the diameter of living trees, and the results are presented in tabular and graphical form. Actual measurements were taken of several trees twice daily from December 15, 1905, to February 17, 1906. The time of observation, temperature, and variation in diameter are indicated.

Investigations on the distribution of native woody plants in the canton of Geneva, Switzerland, A. LENDNER (*Recherches sur la Répartition des Plantes Ligneuses Croissant Spontanément en Suiss. Berne, Dept. Int.* [*1907*], *pp. XVI+63, fig. 1, maps 2*).—This is part 1 of a series of publications to be issued on the native ligneous plants growing in Switzerland and edited under the direction of the federal inspection of forests at Berne and of the botanical museum of the government polytechnic school of Zurich. Some general statements are given on the geology and soil formation in Geneva, together with an enumeration of the occurrence of various species of trees and other woody plants in the canton and methods of culture. The region of the distribution of the more important trees is illustrated by 2 maps.

A new tree juniper for New Mexico (Juniperus megalocarpa), G. B. SUDWORTH (*Forestry and Irrig., 13* (*1907*), *No. 6, pp. 307–310, figs. 2*).—Aside from their economic forest work, the members of the forest survey are making a careful scrutiny of trees wherever found, for the purpose of determining their limits of range.

W. R. Mattoon, of the Forest Service, recently collected notes, photographs, and specimens which enabled the writer to distinguish what is said to be an unique species of juniper. At present this species, which has been named *Juniperus megalocarpa*, is known to occur only in the Gila national forest of New Mexico, where 20 to 30 trees were found grouped together.

Descriptions, with illustrations, are given of the tree, including the trunk, foliage, fruit, and seed.

Forest planting in the North Platte and South Platte valleys, F. G. MILLER (*U. S. Dept. Agr., Forest Serv. Circ. 109, pp. 20*).—In this circular consideration is given to topography, soil, climate, and purposes of forest planting, together with lists of species recommended for planting in both valleys and for experimental purposes, species best adapted to different uses, and notes on planting, cultivation, and subsequent management. The circular concludes with brief descriptive and cultural notes on the various species recommended for planting.

Silvical leaflets (*U. S. Dept. Agr., Forest Serv. Silv. Leaflets, 1, pp. 3; 2, pp. 3; 3, pp. 4; 4, pp. 4; 5, pp. 3; 6, pp. 4; 7, pp. 2; 8, pp. 3; 9, pp. 4; 10, pp. 3; 11, pp. 3; 12, pp. 2; 13, pp. 4; 14, pp. 4*).—A series of leaflets, each one dealing with the range and occurrence, climatic adaptability, habit, associated species, soil and moisture, tolerance, and reproduction of one of the following species of trees, given in order to correspond to the leaflet numbers above: Alpine fir (*Abies lasiocarpa*), Port Orford cedar (*Chamæcyparis lawsoniana*), Engelmann spruce (*Picea engelmanni*), white fir (*A. concolor*), lowland fir (*A. grandis*), Sitka spruce (*P. sitchensis*), noble fir (*A. nobilis*), red fir (*A. magnifica*), incense cedar (*Libocedrus decurrens*), bigcone spruce (*Pseudotsuga macrocarpa*), giant arborvitæ (*Thuja plicata*), yellow cedar (*C. nootkatensis*), western white pine (*Pinus monticola*), and western larch (*Larix occidentalis*).

How and when to collect white pine seed, F. W. RANE (*Boston, 1907, pp. 16, figs. 3*).—In this booklet the author considers in a general manner the life history of white pine seed and gives popular directions on how and when to collect the seed and the method of extracting it from the cones, which should be gathered before they open.

The demand for white pine seed is active and prices in recent years are said to have ranged from $1.50 to $4.50 per pound. The purpose of this pamphlet is to call attention to the importance of gathering the seed each fruiting year, with a view to stimulating forest planting operations and reducing the prevailing price of seed.

Annual report on the forest administration in Ajmer-Merwara for 1905–6, N. Mal (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1905–6, pp. 39*).—This is the customary report of the forest administration in Ajmer-Merwara for the forest year 1905–6, including the constitution, management, and protection of State forests, silvicultural operations, exploitation, and the financial statement for the year. The important features of the work are tabulated.

Progress report of the forest surveys in India for 1905–6, P. J. Gordon (*Rpt. Forest Surveys India, 1905–6, pp. 19, map 1*).—This report includes tabular statements with notes of the forest survey operations in the various provinces of India for the survey year ending September 30, 1906, and is accompanied by a map illustrating the extent of forest surveys in India.

National arboretum of Barres [France], L. Pardé (*Arboretum National des Barres. Paris, Lib. Sci. Nat., 1906, pp. 397, pls. 94, dgms. 21*).—This work consists of an enumeration of the native and exotic species of trees grown in the forest domain of Barres. The origin, synonyms, and distinguishing characters are all indicated, together with a brief discussion as to the requirements and value of each for forestry purposes in France. The text is well indexed, and a large number of the species described are illustrated. Several plans are also given showing the different sections of the arboretum, together with lists of the authors and publications consulted and cited.

Experiments on rubber tapping, W. Peel (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 4, p. 107*).—The results of a series of rubber-tapping experiments carried on during the past year at the Singapore and Penang botanical gardens are presented in tabular form.

One old Para tree was tapped 14 times between November 19 and December 15, and yielded 4 lbs. 4½ oz. of dry rubber, making a total of 35 lbs. 13½ oz. from this tree since it was first tapped. Four other 12-year old trees, tapped 14 times between July 11 and August 6, yielded a total of 6 lbs. 6 oz. of dry rubber.

Camphor production in Formosa and China, J. H. Arnold and S. L. Gracey (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2899, pp. 1–5*).—According to Consul J. H. Arnold, of Tamsui, camphor production in Formosa is confined to trees at least 50 years of age, the cutting down of trees of a less age being prohibited by the government. Recent investigations are said to warrant the statement that the supply of old trees will at the present rate of cutting become exhausted in less than 50 years. Owing to poor sanitary conditions, lack of roads, and the presence of head-hunting tribes of savages, much of the material in Formosa may not be harvested for years. During the present year the Formosa camphor bureau, which controls almost a complete monopoly in the production and sale of the world's supply of camphor, expects to produce 6,667,000 lbs. of crude camphor, and about one-half of that amount of camphor oil.

A brief account is given of the work of afforestation being conducted under the initiative of the government, together with the process of camphor manufacture, and some notes on marketing the product.

Consul Gracey, of Fuchau, reports that in China the camphor trees are being ruthlessly cut down as fast as they can be bought from the owners. A special tax is to be imposed on the camphor and camphor oil produced, which will be expended in planting and cultivating new trees. Five young trees are to be planted for every tree cut down.

DISEASES OF PLANTS.

Report of assistant mycologist, H. S. JACKSON (*Delaware Sta. Rpts. 1904–1906, pp. 70–77, pls. 2*).—Considerable attention was paid by the author to a number of diseases of plants, and notes are given on sun scald and bacteriosis of plums, fire blight of apples, blight of cantaloupes, double blossom of blackberries and dewberries, and anthracnose of peppers.

The author's attention was called in the fall of 1905 to a trouble of fruit trees, affecting plums in particular. The disease was indicated by the cracking of the bark on the trunk of the tree, usually near the ground, though in some cases extending to the first branches. Investigations were carried on to ascertain whether any fungus or other organism was associated with this trouble, and the conclusion is drawn that it was not due to any specific organism. It is thought to have been a true sun scald caused by the alternate freezing and thawing in the spring of the year, and suggestions based upon the experience of other investigators are given for the treatment of the wounds.

The fire blight of the apple was investigated, and the disease was recognized as due to the same organism as that causing the fire blight of the pear. The observations made indicated that the infection is very largely through the blossoms and that not infrequently the bacteria spread from one fruit to another in the cluster through the peduncles. In several cases the organisms were isolated from the decaying peduncles, and cultures made of them successfully inoculated both apple and pear twigs.

The blight of cantaloupes described is that due to *Macrosporium cucumerinum*, a full account of which has already been given (E. S. R., 14, p. 260). Attention is called to the efficiency of Bordeaux mixture when properly applied in preventing this disease and recommendations are made for its use.

In 1905 the attention of the mycologist of the station was directed to a disease of plums locally known as bacteriosis. This disease first makes its appearance as dark sunken areas on the younger twigs, which gradually spread, and, as the twig grows, become cracked, enlarging to form a small canker. The disease is not confined to the bark, but extends into the wood, and appears to start only on the first year's growth. Cultures from diseased spots gave abundant colonies of bacteria, and a number of successful inoculations were made from them. It appears from the preliminary study that this disease is of bacterial origin, although the evidence is not yet considered conclusive. It is not known as yet whether this disease is in any way connected with the bacterial spot of the fruit, due to *Pseudomonas pruni*, but it is thought that it is not the same as that reported by Jones as due to the pear blight organism (E. S. R., 14, p. 880).

Attention is called to the occurrence of double blossoms of blackberry and dewberry, in which there is an abnormal increase and change in the form of the flower parts as well as in the number of branches. The stamens and pistils are usually infertile, consequently no fruit is set. The disease may be detected when the buds are opening, and it is suggested that all canes showing the evidence of formation of rosettes or double flowers should be pruned and burned.

An anthracnose of Cayenne peppers was noticed on truck farms. The disease was found to be due to the fungus *Colletotrichum nigrum*, which is known to affect the ordinary varieties of red peppers. Spraying the plants with Bordeaux mixture or ammoniacal copper carbonate as the fruit approaches maturity is recommended.

Report of the section of seed control, Hohenheim, 1906, O. KIRCHNER (*Württemb. Wchnbl. Landw., 1907, No. 17, pp. 347–353*).—The principal investigations during the year have been studies of the susceptibility of varieties of wheat to smut and rust, the diseases and insect enemies of clovers, various garden and orchard crops, forest trees, and ornamentals, and the means for their repression. Studies are also reported upon various weeds, a number of which were successfully destroyed by spraying the fields with 15 to 25 per cent solutions of iron sulphate. This treatment was especially efficient in destroying wild mustard and wild radish.

Sprout infection by smuts, L. HECKE (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 6, pp. 572–574*).—As a result of his experiments the author claims that in addition to smut infection through the flowers and seedlings, a third method must be recognized, in which the infection takes place through the young shoots, and probably in the case of cereals through the stooling shoots of the plant. He thinks this method of infection quite common for *Ustilago violacea* and *Urocystis occulta* and possibly other species of smuts.

New species of fungi, C. L. SHEAR (*Bul. Torrey Bot. Club, 34 (1907), No. 6, pp. 305–317*).—Technical descriptions are given of the following new species and varieties of fungi discovered by the author on the leaves and fruits of the cranberry: *Cladosporium oxycocci* n. sp., *Helminthosporium inæquale* n. sp., *Phyllosticta putrefaciens* n. sp., *Sphæronema pomorum* n. sp., *Septoria longispora* n. sp., *Sporonema oxycocci* n. sp., *S. pulvinatum* n. sp., *Plagiorhabdus oxycocci* n. sp., *Leptothyrium oxycocci* n. sp., *Rhabdospora oxycocci* n. sp., *Ceuthospora (?) lunata* n. sp., *Anthostomella destruens* n. sp., *Acanthorhynchus vaccinii* n. sp., *Glomerella rufomaculans vaccinii* n. var., *Glœosporium minus* n. sp., and *Guignardia vaccinii* n. sp. The last species is said to be the cause of the serious cranberry scald, first described, but without name, in Bulletin 64 of the New Jersey Stations (E. S. R., 1, p. 263).

In addition other species of fungi are described, among them *Ozonium omnivorum* n. sp. from cotton roots. This fungus is said to occur from eastern Texas to southern California and is a facultative parasite infesting the soil and attacking the roots of a great variety of plants, causing serious damage to such cultivated crops as cotton, alfalfa, cowpeas, sweet potatoes, beets, and fruit trees. The cotton root rot hitherto attributed to *O. auricomum* is said to be due to *O. omnivorum*, and while the other species occurs in Texas, so far it has been observed only as a pure saprophyte.

New and additional species of fungi, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1907, No. 6, pp. 238–244, pl. 1*).—A list of the species of fungi observed by the author in the Kew Gardens is given. Among the species mentioned are the following parasitic forms: *Pyrenochæta phloxidis* n. sp. occurring on phlox, *Ascochyta cookei* n. sp. on sweet william, and *Ramularia necator* n. sp. on the cotyledons of seedling cacao.

P. phloxidis was quite destructive to a bed of phlox, the foliage first assuming a greenish-yellow color, and afterwards wilting and falling to the ground, followed by a breaking of the stems near the base. The species of Ascochyta resembles *A. dianthi*, but differs in some very important characters. The species of fungus on the cacao was observed on the cotyledons of plants grown from seeds recently obtained in Jamaica. It proved to be truly parasitic and quite destructive, and the author raises the question whether this fungus has been observed as a parasite on cacao seedlings in Jamaica.

Celery root rot, J. M. VAN HOOK (*Ohio Sta. Circ. 72, pp. 6, figs. 3*).—In 1904 a serious root rot of celery was reported from a number of districts in Ohio, the affected plants being characterized by a decay of the main roots, leaving only the crown, usually in the form of an inverted cone, so that the plants are readily lifted from the ground. The remaining portions of the root are black or brown in color, and the disease is found to extend to the bases of the outer leaf stalks, which after infection die. The decay of the roots is usually complete. In some cases, particularly among young plants, new roots appear, but the plants never attain full size or wholly recover from the injury.

So far as the writer knows, this disease, which seems quite distinct from black rot or heart rot, has never been described.

The disease appeared in soils in which celery had been grown for many successive years, and a species of Rhizoctonia was found on many of the roots. A careful study of the fungus led the author to believe that it was not wholly responsible for the trouble, at least not in the beginning, nor could any bacteria or other organisms be found constantly associated with it. The diseased spots in the fields always seemed to be where the ground was slightly lower or not well drained, and it seems clear that soil conditions were responsible for a considerable portion of the trouble. It is believed that poorly drained soils are the primary cause of this root rot and that the Rhizoctonia is associated with it only in the later stages of decay.

Potato spraying experiments in 1906, F. C. Stewart et al. (*New York State Sta. Bul. 290, pp. 239–321, pls. 2*).—This is a report of the fifth year of the 10-year series of potato spraying experiments begun in 1902. The experiments were carried out on the same lines as previously indicated (E. S. R., 18, p. 52), 80 separate experiments being reported in this bulletin.

At Geneva, 5 sprayings increased the yield 63 bu. per acre, while 3 sprayings increased it 31.75 bu. The gain is said to be due chiefly to the prevention of the late blight. At Riverhead the gain due to 5 sprayings was 53.25 bu. per acre and to 3 sprayings 21.5 bu. Here the chief enemies were the flea-beetle and the late blight. No rot was observed at either station.

In the farmers' business experiments, in 15 experiments, including 225.6 acres sprayed 5 or 6 times, the average gain due to spraying was 42.6 bu. per acre. The total cost of spraying was $5.18 and the average net profit $13.89 per acre.

In the volunteer experiments, 62 experimenters sprayed 598 acres and report gains averaging 44.5 bu. per acre, the largest being 132.6 bu., while 2 report no gain whatever.

Five years of potato spraying, F. H. Hall et al. (*New York State Sta. Bul. 290, popular ed., pp. 12*).—A popular edition of the above.

The nature and control of blackleg of potatoes, Kleberger (*Ztschr. Pflanzenkrank., 17 (1907), No. 2, pp. 80–83*).—The blackleg of potatoes is said to spread from the seed tubers to the stems and young tubers, causing their destruction. The direct infection of the stems seems to be also probable. A large amount of humus in the soil or heavy applications of stable manure favor the development of the disease, and early and medium varieties of potatoes are more subject to it than those maturing late in the season. The disease in the field may spread from plant to plant, the rapidity of the spread depending on the distance separating the plants as well as the amount of humus in the soil.

Soaking seed potatoes in fungicides before planting was tested, and as a result a 2 per cent Bordeaux mixture solution is recommended as more efficient than corrosive sublimate in controlling the disease.

A disease of peas and beans, P. Masseron (*Semaine Agr. [Paris], 26 (1907), No. 1370, p. 270; noted in Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), No. 35, p. 267*).—An account is given of a sclerotium disease of peas and beans, which is due to the fungus *Sclerotinia libertiana.*

This disease was especially destructive in certain regions in France during the spring of 1907. Its unusual development is said to be due to the intensive culture of peas, that crop being frequently grown successively upon the same soil, and also to favorable conditions of humidity and temperature. The fungus is said to attack peas, beans, Jerusalem artichokes, ruta-bagas, carrots, beets, maize, and hemp.

In order to prevent its destructive occurrence, it is recommended that rotations should be followed so that for a period of at least 4 years susceptible plants should not occupy the soil. In addition the débris of all diseased plants should be collected and burned and not scattered over the soil, as is the common practice.

A disease of peanuts, A. Zimmerman (*Pflanzer, 3 (1907), No. 9, pp. 129–133*).—An account is given of a disease of peanuts in German East Africa by which about 10 per cent of the plants were destroyed. The cause of the disease is not definitely determined, but it is believed to be similar to those producing the mosaic disease of tobacco, leaf curl of cassava, and infectious chlorosis of a number of mallows.

Preliminary note on a new disease of the cultivated vetch, G. F. Atkinson and C. W. Edgerton (*Science, n. ser., 26 (1907), No. 664, pp. 385, 386*).—In July, 1906, the attention of one of the authors was called to a fungus disease of the cultivated vetch, which does not seem to have been reported. It was first observed on stems and pods in the horticultural grounds of Cornell University and was later brought to the laboratory from fields of vetch growing on the university farm.

The disease appeared quite abundant and was often associated with an Ascochyta, especially on the stems. Here the fungi are often mixed together, so that it is probable that they would be confused. When occurring on the pods the disease is easily distinguished with the unaided eye, as the gross appearance of the spots and spore pods are very striking. The spots are elongated, forming either long narrow or elliptical spots, sometimes with a dull purple border. The spots on the pods are oblique, probably due to the oblique fibrous structure of the pods. The middle line of the spot is white from the numerous spores formed on the basidia, which later ooze out in masses.

In the case of the Ascochyta the spots are nearly always circular, and grayish in color, with a dull purple border.

The fungus appears to be the type of a new genus for which the name *Protocoronospora* is proposed. The species *P. nigricans* n. sp. is provisionally described.

The parasitism of Neocosmospora, E. F. Smith (*Science, n. ser., 26 (1907), No. 663, p. 347–349*).—This is a review and criticism of the experiments and conclusions of H. S. Reed upon the parasitism of this fungus (E. S. R., 18, p. 152).

Apple mildew, E. S. Salmon (*Gard. Chron., 3. ser., 42 (1907), No. 1079, p. 166*).—A note is given on the occurrence of apple mildew (*Podosphæra leucotricha*), which it is stated has attacked the fruit in the orchards connected with the agricultural college at Wye, England. In all cases observed the leaves and fruit of the trees were attacked, but as yet no serious injury has been introduced. In many cases the parasitic fungus *Ampelomyces quisqualis* had attacked the mildew and would no doubt greatly retard its spread.

Attention is called to the fact that the apple mildew is sometimes erroneously called *Spærotheca mali*.

The relation of twig cankers to the Phyllosticta apple blotch, W. M. Scott and J. B. Rorer (*Reprinted from Proc. Benton Co. [Ark.], Hort. Soc. 1907, pp. 6*).—According to the authors, the blotch disease due to Phyllosticta was first reported in a bulletin of the Illinois Station (E. S. R., 13, p. 1089). Since that time the disease has become more widely spread and is now recognized as one of the most destructive of the apple fruit diseases in Arkansas.

During the progress of these investigations there were noticed on the fruiting branches and other shoots, particularly the water sprouts, numerous cankers, which contained spore-bearing pycnidia. An examination of these cankers and inoculation experiments have shown the identity of the fungus, so that it seems certain that the same species produces blotches on the fruit, cankers on the twigs, and spots on the leaves.

In connection with spraying experiments for the control of orchard diseases, the authors have found that apple blotch can be readily prevented by thorough spraying with Bordeaux mixture. As the fungus winters over in the cankers on the twigs, it is believed that by thorough spraying for two or three years, it could be practically eliminated.

The gummosis of the Amygdalaceæ, A. RANT (*Inaug. Diss., Amsterdam, 1906; abs. in Ztschr. Pflanzenkrank., 17 (1907), No. 3, pp. 179, 180*).—The author gives a review of the theories of gum formation, after which he describes the anatomical changes associated with it. He claims that a distinction should be made between the gum that is formed within the cells and that in the intercellular spaces. Only the intercellular formation of gum gives rise to the phenomena associated with the disease known as gummosis.

The formation of gum in the intercellular spaces is said to be due to the development of new tissues, the lignification of tissues, and the activity of wounded cells. The activity of the wounded cells is often caused by attacks of bacteria, fungi, and boring insects. Among the more common fungi are *Clasterosporium carpophilum* and *Coryneum beijerinckii*. *Cytospora leucostoma*, or *Valsa leucostoma*, is less important but causes the peculiar gummosis of cherry trees that is characterized by the accumulation of gum under the bark. Species of Monilia also cause gummosis of various stone-fruit trees, and *Botrytis cinerea* produces the disease on cherry trees. Bacteria are also said to cause this disease.

Concerning the origin of the gum on cherry trees, K. MIKOSCH (*Sitzber. K. Akad. Wiss.* [*Vienna*], *Math. Naturw. Kl., 115 (1906), No. 6, pp. 911-961, pls. 4*).—A discussion is given of the origin of the gum that accompanies the disease of cherries known as gummosis. This gum is considered a pathological product and follows wounds of the cambium, its formation taking place within the inner portions of the cambium layer.

A peach disease (*Gard. Chron., 3. ser., 42 (1907), No. 1078, p. 160, fig. 1*).—A disease of peaches due to *Helminthosporium rhabdiferum* is briefly described. This fungus, which causes a black moldy appearance of the ripened fruit, was first observed and described by Berkeley in 1864, but it appears not to have been recognized since that time. Although the fungus is rare, from the nature of its attack it would probably prove a decided pest if abundant.

The writer recommends the picking and burning of diseased fruits and spraying the trees with dilute Bordeaux mixture where the disease is present.

Diseases of strawberries (*Österr. Gart. Ztg., 2 (1907), No. 9, pp. 317-320*).—A summary is given of fungus and insect injuries to the strawberry. For the prevention of the various root diseases, the author recommends the sterilization of the soil where the plants are to be set with a weak solution of formaldehyde. To combat the attacks of Ramularia, Phyllosticta, and Ascochyta on the leaves the use of a 1 per cent Bordeaux mixture is advised. For the false or downy mildew spraying with Bordeaux mixture or ammoniacal copper carbonate is considered advantageous. For the prevention of powdery mildew, sulphur should be dusted over the plants or they should be sprayed with a fresh solution of potassium sulphid.

Studies on the development of Glœosporium ribis, the means of infection, and the methods for combating it, R. EWERT (*Ztschr. Pflanzenkrank., 17 (1907), No. 3, pp. 158-169, pls. 2*).—A description is given of the development of *G. ribis*, or *Pseudopeziza ribis*, together with the results of experiments on its means of infection and methods for preventing its attack upon currants.

The conidia were found to retain their viability over winter, and, it is believed, probably their power to infect the host plant also. The author thinks it doubtful whether the mycelium is perennial. Artificial inoculations show some natural resistance by the host toward the fungus. The disease is said to be limited by the age of the plants, as even with the most susceptible sorts it was impossible to infect either the leaves or stems until they had attained a certain growth and age. The time of natural infection is during May, and spraying with fungicides containing copper should be made early in that month.

Bordeaux mixture, S. Pickering (*Gard. Chron., 3. ser., 42 (1907), No. 1078, p. 150*).—In an editorial note an account is given of investigations on the chemistry of Bordeaux mixture.

It is stated that the claim that Bordeaux mixture consists principally of copper hydroxid is not based upon fact, since it consists of 5 complex substances formed by the action of lime on copper sulphate, the particular one depending on the proportions used. In making Bordeaux according to the ordinary formula, where the weight of lime used is from 4 to 6 parts to every 6 parts of crystallized copper sulphate, the substance formed is said to be a double basic sulphate of copper and calcium. However, where the lime is reduced to the lowest proportions consistent with the precipitation of the whole of the copper, the substance formed is essentially a basic sulphate of copper. In the former case when the mixture is exposed to the air the basic calcium sulphate present will be attacked by carbon dioxid, and until the calcium sulphate has all been converted into carbonate, the basic copper sulphate will remain practically intact. Where the basic sulphate is present there will be no period in which the fungicidal action is suspended, as there is no basic calcium sulphate present. This is held to be a decided advantage, as with the latter compound for equal weights of copper taken, two and one-half times as much copper sulphate would be liberated as with the double basic compounds.

For the preparation of the basic sulphate of copper, the author recommends the use of limewater in the proportion of 107 pints of limewater to each pound of copper sulphate. Bordeaux mixture made by this method is said to be more efficient and cheaper than that made by the ordinary formula. It is claimed that in all cases Bordeaux mixture should be tested in order to prevent the scorching due to an excess of copper sulphate.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Game commissions and wardens; their appointment, powers, and duties, R. W. Williams, Jr. (*U. S. Dept. Agr., Biol. Survey Bul. 28, pp. 285, pls. 8*).—This bulletin contains a general account of the office and duties of wardens, a condensed summary of the provisions of game laws relating to enforcement and the full text of such laws. The subject-matter is restricted to State laws. The topics are elaborately discussed and the matter is arranged for ready reference.

Game laws for 1907, T. S. Palmer, H. Oldys, and C. E. Brewster (*U. S. Dept. Agr., Farmers' Bul. 308, pp. 52, figs. 4*).—The essential new features of game laws passed in 1907 are given. The close seasons for different kinds of game in the various States are shown in a tabular form. The license system for hunting and shipping game is also discussed.

Our feathered immigrants, J. Drummond (*New Zeal. Dept. Agr., Divs. Biol. and Hort. Bul. 16, pp. VII + 49, pls. 8*).—A circular letter of inquiry was sent to the correspondents of the department regarding the economic relations of introduced birds, a list of which was supplied. Considerable evidence was thus collected as to the injuriousness of English sparrow, skylark, blackbird, song thrush, greenfinch, etc. On the other hand, good reports were received regarding lapwing, hedge sparrow, starling, etc.

It is evident from the New Zealand experience that no bird should be introduced in a country without a previous careful study of its habits. The author presents in a tabular form notes on the relative abundance of various native and introduced birds.

The introduction of top minnows into the Hawaiian Islands, D. L. Van Dine (*Hawaii Sta. Press Bul. 20, pp. 10, figs. 3*).—In 1904, top minnows belonging to the species *Gambusia affinis*, *Fundulus grandis*, and *Mollienesia latipinna* were collected in Texas by A. Seale, taken to Hawaii and liberated in ponds. About 75 of each species were introduced. They have multiplied to hundreds of thousands and have been planted in the waters of 5 islands. They thrive best in shallow water at a temperature of 76 to 82° F. The top minnows effectively rid the waters of mosquito larvæ and promise to be of great help in the problem of eradicating mosquitoes.

Report of the entomologist, D. L. Van Dine (*Hawaii Sta. Rpt. 1906, pp. 18–32*).—Considerable attention has been given to the encouragement of the silk industry in Hawaii. In cooperation with the Bureau of Entomology of this Department eggs of the Oro race of silkworms and other races have been imported and tested. The cocoons obtained in this experiment yielded a satisfactory amount of silk upon reeling, but lost too much in weight upon boiling out.

Neither European nor American foul brood of bees exists in Hawaii, and some attention is therefore being given to the encouragement of beekeeping. For this purpose an attempt is being made to introduce more desirable races and crosses of bees than the Italian bees which are already present in the islands.

A report is given on the successful introduction of fish for the destruction of mosquito larvæ. (See above.) The list of injurious insects of Hawaii is continued, and a list is given of the accessions to the entomological library relating to Hawaiian entomology.

Report of the entomologist, C. O. Houghton (*Delaware Sta. Rpts. 1904–1906, pp. 77–107*).—In controlling the apple-leaf miner fall plowing, spraying in June with a 10 per cent kerosene emulsion, and destruction of the leaves in the fall are recommended. Little benefit was noted from the use of sticky bands in capturing plum curculio.

Experiments in greenhouse fumigation indicate that white flies and plant lice may be readily controlled at very little expense. Fumigation with hydrocyanic-acid gas should be done at intervals of 4 to 6 weeks.

As a remedy for mosquito larvæ, crude petroleum proved better than kerosene, but a proprietary oil preparation was even more efficient. A list of the Coleoptera of Delaware is given together with notes on cabbage plutella, cabbage butterfly, rose leaf beetle, and oyster-shell bark-louse.

Injurious insects and other animals observed in Ireland during the year 1906, G. H. Carpenter (*Econ. Proc. Roy. Dublin Soc., 1 (1907), No. 11, XIX, pp. 421–452, pls. 6, figs. 11*).—Sheep were freed from *Trichodectes sphærocephalus* by dipping twice in arsenic and whale-oil soap. Barley was attacked by *Elachyptera cornuta*. Cabbage was damaged by diamond-back moth, root-gall weevil, and *Psylliodes chrysocephala*.

Notes are also given on *Silpha opaca*, cutworms, winter moth, plum aphis, oyster-shell scale, black-currant mite, pine weevil, *Phyllodecta vulgatissima*, etc.

Work of the zoological and entomological laboratory, J. Vosseler (*Ber. Land u. Forstw. Deutsch-Ostafrika, 3 (1907), No. 3, pp. 108–119*).—Among injurious locusts *Zonocerus elegans* caused most damage. Sisal was attacked by a species of Achræa. Mention is made of the most important insect pests of cotton, cocoanut, rubber plants, coffee, castor oil plant, fruit trees, cinchona, garden vegetables, etc.

Greenhouse pests of Maryland, A. B. Gahan (*Maryland Sta. Bul. 119, pp. 36, figs. 8*).—The author aims to give an account of the appearance, habits, and life history of all the important animal pests of greenhouses in Maryland. These include mealy bugs, various scale insects, plant lice, white fly, red spider, thrips, wireworms, snow bugs, and slugs.

The proposed remedies include syringing with water, fumigation, dusting, spraying, and dipping. Directions are given for the preparation and application of insecticides.

The periodical cicada, C. L. Marlatt (*U. S. Dept. Agr., Bur. Ent. Bul. 71, pp. 181, pls. 6, figs. 68*).—This is a thorough revision of Bulletin 14 of the Division of Entomology (E. S. R., 10, p. 1071). Additional data are given on the habits of the periodical cicada. The broods of the insect have been so renumbered as to indicate their relationship in time and geographical distribution. An extensive bibliography of the subject is presented (pages 154–169).

Locust destruction (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 6, pp. 609–617*).—An intercolonial conference was held by representatives of the British colonies of South Africa. It appears desirable that each colony should seriously attack the locust problem. The best remedy is a sweetened solution of arsenite of soda. Treatment should be applied to the locusts in their nymphal stage.

The spring grain-aphis or so-called "green bug," F. M. Webster (*U. S. Dept. Agr., Bur. Ent. Circ. 93, pp. 18, figs. 7*).—The third serious outbreak of *Toxoptera graminum* in the United States occurred during the last spring. The pest is distributed east of longitude 105° and south of latitude 41°, and breeds from sea level to an altitude of 5,000 ft. During warm weather a generation is passed in 8 days. In ordinary seasons the natural enemies of this pest keep it in check. In addition to cereals the insect has several alternative food plants.

Tobacco dust had no effect on the aphis, but kerosene emulsion gave good results. Parasites, particularly *Lysiphlebus tritici*, overcome the aphis unaided if weather conditions are favorable, but colonization of the parasites is of no avail. Much good may result from plowing and harrowing infested ground, running a surface fire, or from the use of kerosene emulsion. Rotation of crops, better cultural methods, and irrigation have also proved of considerable importance in the control of the aphis.

The chinch bug, F. M. Webster (*U. S. Dept. Agr., Bur. Ent. Bul. 69, pp. 95, figs. 19*).—This is a revised and enlarged edition of Bulletin 15 of the Division of Entomology (E. S. R., 10, p. 1069). Particular attention has been given to a revision of the remedies for controlling the chinch bug and to the study of its origin and distribution.

Cotton insects, L. de la Barreda (*Bol. Com. Par. Agr., 4 (1907), No. 2, pp. 107–215, pls. 24, map 1*).—A series of questions was sent to various planters in Mexico regarding the prevalence, injurious attacks, and means commonly adopted for combating the cotton-boll weevil. The replies received are summarized by the author. Considerable attention is given to the work of the Bureau of Entomology of this Department in the control of the boll weevil.

The sugar-cane leaf-roller, with an account of allied species and natural enemies, O. H. Swezey (*Hawaiian Sugar Planters' Sta., Div. Ent. Bul. 5, pp. 61, pls. 6, figs. 3*).—A technical description is given of *Omiodes accepta* and of various other species of that genus. The life history and food plants of each species are discussed. A table is given for the identification of the species.

Omiodes may be destroyed by spraying young cane plants with arsenicals or by hand picking. The life history and economic importance of various parasites of Omiodes are discussed.

Papers on deciduous fruit insects and insecticides. The pear thrips, D. MOULTON (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 1, pp. 16, pls. 2, figs. 8*).—*Euthrips pyri* has caused serious damage to deciduous fruit trees in the Santa Clara Valley and San Francisco Bay counties for the past 2 or 3 years. It attacks the buds of peach, apricot, pear, prune, cherry, apple, and other trees, causing perhaps most injury to pears. The adult thrips appear in February and March and disappear about the middle of May. From that time until the next spring the insect lives in the soil at a depth of about 4 or 5 in.

The eggs are deposited in the blossoms, stems, leaf petioles, and leaf veins, and as soon as the young hatch they feed upon the tender parts of the leaves. A technical description is given of the insect in its different stages.

In combating this pest contact insecticides have been found effective upon the exposed thrips, but soon after spraying the trees appear to be reinfested from thrips which were not touched by the spray and from other sources. It is believed that a thorough cultivation of the soil will destroy a considerable percentage of the larvæ and nymphs. The thrips are preyed upon by a few predaceous enemies and are also attacked by a parasitic fungus belonging to the genus Cladosporium.

Papers on deciduous fruit insects and insecticides. The spring cankerworm, A. L. QUAINTANCE (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 2, pp. 17–22, pls. 2*).—The spring cankerworm causes the almost total defoliation of orchards in certain localities. For controlling this pest it is recommended on the basis of demonstration experiments that infested orchards be sprayed with Paris green (1 lb. in 100 gal. of water) or arsenate of lead (6 to 10 lbs. in 100 gal. of water). If the Paris green is not used in Bordeaux mixture, 5 or 6 lbs. of lime should be added for each 100 gal. of water. Moreover the soil about the trees should be thoroughly cultivated in summer, and some benefit may be expected from the use of sticky bands on the trunks of the trees.

Papers on deciduous fruit insects and insecticides. The trumpet leaf-miner of the apple, A. L. QUAINTANCE (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 3, pp. 23–30, pl. 1, fig. 1*).—*Tischeria malifoliella* is described in all its stages, and notes are given on its history and distribution. The insect has been reported on apple, haw, crab, raspberry, etc. The author did not observe it on blackberry.

There are two broods annually. The insect is distributed from South Carolina to Canada. A number of parasites attack the pest. Badly infested leaves fall prematurely. The insect may be partly controlled by plowing the ground in spring and by spraying with a 12–15 per cent kerosene emulsion.

Papers on deciduous fruit insects and insecticides. The lesser peach borer, A. A. GIRAULT (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 4, pp. 31–48, pl. 1, fig. 1*).—This insect, although described in 1868, has not been considered an important pest until recent years. It occurs on both wild and cultivated plums and cherries, Juneberry, beach plum, chestnut, and peach, showing a preference for the peach. The insect is distributed from Canada to Florida and to the Pacific Coast, but appears to be most injurious to peaches in New Jersey, New York, Virginia, Ohio, Georgia, and Maryland.

The lesser peach borer passes the winter in the larval condition under the bark. The moths appear in March and April, deposit their eggs soon afterwards, and the young penetrate through the crevices of the bark. There are 2 generations annually. The insect is carefully described in all its stages. Apparently the adults do not live longer than 1 week. The life cycle of the summer generation is about 4½ months and of the winter generation 7½ months.

A number of natural enemies, mostly Hymenoptera, have been observed. The best means of controlling the insect consist in good cultivation and care of the peach orchards and in cutting the larvæ out of their burrows.

The Howard scale, E. P. Taylor (*Colorado Sta. Bul. 120, pp. 19, figs. 4*).—*Aspidiotus howardi* was discovered on the fruit and bark of the prune and wild plum in 1894. It now occurs in many fruit orchards in Colorado, and appears to be a native of the State. It is less destructive than the San José scale, but it attacks pear, plums, and prunes.

A number of natural enemies have been observed which help to keep the pest in check, but the main reliance must be placed on the use of lime-sulphur wash in late spring.

Codling moth, C. Börner (*Mitt. Bl. K. Preuss. Verwalt. Landw., Domänen u. Forsten, 3 (1907), No. 4, Anz. Beilage, pp. 104–107, figs. 6*).—The appearance and life history of the codling moth are briefly outlined. The pest is to be combated by the use of bands about infested trees, destruction of windfall apples, and spraying with Bordeaux mixture containing an arsenical.

Mites and lice on poultry, N. Banks (*U. S. Dept. Agr., Bur. Ent. Circ. 92, pp. 8, figs. 6*).—A description is given of the common chicken mite. This pest may best be controlled by repeated spraying of hen houses with kerosene emulsion. Other remedies, such as lime and sulphur or whitewash and carbolic acid, have given fairly good results. The mite which causes scaly legs may be controlled by the use of warm soap suds and sulphur ointment. Brief notes are also given on *Cnemidocoptes gallinæ*, *Rivoltasia bifurcata*, and *Argas miniatus*.

In controlling chicken lice mixtures of carbolic acid and lime, or kerosene, sulphur, and lime, or kerosene and naphthaline may be used. Notes are also given on *Menopon biseriatum*. If eggs are hatched in incubators and chickens cared for in brooders, poultry may be raised without becoming infested with lice and mites.

Dipping nursery stock in insecticides, C. P. Close (*Delaware Sta. Rpts. 1904–1906, pp. 48–69*).—Nursery stock of apple, pear, plum, and peach trees was dipped in kerosene limoid emulsion, pure kerosene, crude petroleum, lime-sulphur-salt wash, and a number of proprietary insecticides. The stock was dipped and planted from April 25 to May 4. As a result of these tests it appears undesirable to dip the roots of nursery stock. As a dip for the tops kerosene, crude petroleum, and a 25 per cent kerosene limoid emulsion are recommended for apples and pears, and for plums crude petroleum and kerosene limoid 30 to 50 per cent. The results obtained with peaches are not considered satisfactory.

Young strawberry plants of several varieties were dipped in various strengths of kerosene limoid emulsion, whale-oil soap-kerosene emulsion, whale-oil soap alone, and tobacco with or without whale-oil soap. The mixtures containing kerosene injured the plants quite seriously, while those containing tobacco or whale-oil soap were relatively harmless.

Fumigation for the destruction of insects, A. I. Kendall (*Proc. Ann. Conf. Sanit. Off. N. Y., 6 (1906), pp. 191–196*).—Attention is called to the work which has been done in the destruction of mosquitoes and household insects in Cuba, Panama, and elsewhere. In this work sulphur, pyrethrum, camphor and carbolic acid, hydrocyanic-acid gas, etc. have been used.

Lead arsenate and Paris green, J. P. Street and W. E. Britton (*Connecticut State Sta. Bul. 157, pp. 13*).—The content of arsenic oxid in samples of lead arsenic varied from 11.29 to 21.91 per cent, and the lead oxid from 25.59 to

44.05 per cent. The percentage of soluble arsenic was low in all samples. The impurities were partly nitrates but were not determined more accurately. At the usual market prices lead arsenate is cheaper than Paris green.

In samples of Paris green the amount of arsenious oxid ranged from 56.2 to 61.19 per cent, and cupric oxid from 25.56 to 30.27 per cent. Most of the samples contained too much soluble arsenic.

Directions were given for the preparation and use of lead arsenate and Paris green.

Pyrethrum powder, A. L. Herrera (*Com. Par. Agr. [Mexico], Circ. 61, pp. 24, pls. 6*).—A botanical discussion is given on the plants from which pyrethrum powder is made. The uses of this powder in the control of various insect pests are also mentioned. The methods of preparation of pyrethrum powder are described and notes are given on its chemical composition.

Spray materials, C. L. Penny (*Delaware Sta. Rpts. 1904–1906 pp. 34, 35*).—It was observed that carbon dioxid decomposes lime-sulphur-salt wash setting free sulphureted hydrogen and sulphur. It is doubtful, however, whether in case this gas is compressed in a power-spraying apparatus a sufficient length of time will be given for it to act disastrously upon the composition of the insecticide.

Proceedings of the nineteenth annual meeting of the Association of Economic Entomologists (*U. S. Dept. Agr., Bur. Ent. Bul. 67, pp. 145, pl. 1, figs. 7*).—The nineteenth annual meeting of the Association of Economic Entomologists was held at Columbia University, New York City, December 28, 29, 1906. At this meeting a number of papers on entomological topics were presented, together with reports of committees on nomenclature, cooperative testing of insecticides, and National control of introduced insect pests. As at previous meetings of the association, several short papers were presented dealing with the biological and economic aspects of the more important insect pests of the year. Such accounts were presented for Minnesota by F. L. Washburn, for New Jersey by J. B. Smith, for Maryland by A. B. Gahan and G. P. Weldon, for New York by E. P. Felt, for Georgia by R. I. Smith, for the Philippines by C. S. Banks, and for Central Alberta by P. B. Gregson.

The Occurrence of the Gipsy Moth in Connecticut was discussed by W. E. Britton (pp. 22–26). The work of eradication has progressed satisfactorily and it is now difficult to find any indication of the gipsy moth. W. J. Schoene reported the willow borer as very destructive to nursery plantations of poplar and willow (pp. 27, 28). Some benefit was derived from the use of arsenical sprays. Aphis eggs, particularly those of species which occur on apples, are nearly all destroyed by spraying with sulphur wash or crude oil, according to experiments by H. E. Hodgkiss (pp. 29, 30). Accounts were also presented on the manner of birth of the woolly aphis, by W. E. Rumsey (pp. 31–33); of injury by the pear blister mite to apple leaves, by P. J. Parrott (pp. 43–46); and of the natural enemies of the cottony maple scale, by E. L. Dickerson (pp. 48–52).

The different methods used in estimating the benefit of spraying for codling moth were discussed by A. F. Burgess (pp. 53–55). E. D. Ball presented a paper on The Control of the Codling Moth in the Arid Regions (pp. 55–75). The codling moth in Utah has been shown to be definitely two-brooded. It is so abundant as to require 5 to 8 insecticide applications. More than two-thirds of the first brood and nearly two-thirds of the second brood of larvæ enter the calyx and about 98 per cent of these larvæ were destroyed by two early applications.

Suggestions regarding suitable subjects for entomological research under the Adams Act were made by E. D. Sanderson (pp. 77–84). B. H. Walden reported a new sawfly (***Pamphilius persicum***) as injurious to peach leaves (pp. 85, 86).

The practical work done in Colorado in combating the Howard scale was discussed by E. P. Taylor (pp. 87–93). Good results were obtained from the use of lime-sulphur mixture and other insecticides. F. M. Webster discussed the value of parasites in the control of the insect enemies of cereals and forage crops (pp. 94–100). In this paper particular attention was given to wheat midge, Hessian fly, jointworms, and army worm.

A paper on the insect enemies of tobacco in Florida was discussed by W. A. Hooker (pp. 106–111), special mention being made of bud worms, tobacco worms, tobacco flea-beetle, grasshoppers, tobacco leaf-miner, cutworms, and leaf hoppers. E. D. Sanderson presented suggestions regarding the construction of a spray nozzle which will give definite proportions of a mechanical mixture of oil and water (pp. 112–116).

The other papers presented at the meetings included one on *Gastrophilus nasalis* and *Ceratopogon eriophorus* and insects in relation to leprosy, by C. F. Baker (pp. 117–119). On the Eradication of the Black-Currant Gall-Mite, by W. E. Collinge (pp. 119–123; and the destruction of mosquitoes in houses by means of chrysanthemum, by A. L. Herrera (pp. 123, 124).

Report of the meeting of inspectors of apiaries (San Antonio, Tex., November 12,) 1906 (*U. S. Dept. Agr., Bur. Ent. Bul. 70, pp. 79, pl. 1*).—At a meeting of inspectors of apiaries in San Antonio, Texas, November 12, 1906, a number of papers were read, which have been collected in the present bulletin.

The Bacteriology of Bee Diseases was discussed by G. F. White (pp. 10–18). The speaker recognized 3 infectious bee diseases—European foul brood, American foul brood, and pickle brood.

E. F. Phillips referred to The Present Status of the Investigation of Bee Diseases. A historical account of the subject was given and detailed notes were presented on the growth and behavior of *Bacillus alvei*, *B. A.*, and *B. larvæ*.

Apiary inspection in New York was considered by C. Stewart. An inspector must be a practical bee raiser. No bees are strictly immune to disease, but vigorous Italians are nearly so.

F. A. Parker spoke of American Foul Brood on the Pacific Coast. In California the disease behaves somewhat differently than in other parts of the country. Some bee raisers have as many as 4,000 swarms. The disease spreads rapidly in many cases. Much careful attention is required on the part of the inspectors to prevent disaster.

N. E. France outlined the history of bee inspection in Wisconsin, referring particularly to the difficulties met by the inspector in carrying out the State law.

Practical bee keeping, R. Benton (*Montana Sta. Bul. 67, pp. 75, pls. 4, figs. 15*).—A summary is given of information important to the beginner and small apiarist. The bulletin is based on available data and experiments in Montana. The subject-matter includes the structure, habits, and varieties of the honey bee, and a discussion of honey plants, beehives, handling of bees, starting an apiary, wintering bees, queen rearing, control of swarming, production of honey, and diseases of bees.

Bee culture, I. Hopkins (*New Zeal. Dept. Agr., Divs. Biol. and Hort. Bul. 18, pp. 34, figs. 24*).—Practical directions are given regarding the care and management of bees, including the location of the apiary, hives, and other bee apparatus, honey plants, etc. A special section of the bulletin is devoted to a discussion of the relation of bees to flowers and fruit growing.

The cause of American foul brood, G. F. White (*U. S. Dept. Agr., Bur. Ent. Circ. 94, pp. 4*).—The author had previously announced the occurrence of *Bacillus larvæ* in American foul brood. In experiments reported in this circular the disease was transmitted to healthy colonies of bees by material from diseased larvæ and by pure cultures of *B. larvæ*. A new culture medium containing the sterile filtrate of healthy bee larvæ has been prepared for use in the cultivation of *B. larvæ*. It is held that the structures described by A. Maassen as *Spirochæta apis* are nothing but the giant whips of *B. larvæ*.

Influence of high temperatures on the eggs of silkworms, E. QUAJAT (*Agr. Mod., 13* (*1907*), *No. 36, pp. 507–509*).—Temporary exposure of the eggs of various races of silkworms to temperatures up to 45° C. had no apparent effect upon the development of the larva or the quality of the silk produced.

FOODS—HUMAN NUTRITION.

The economic seaweeds of Hawaii and their food value, MINNIE REED (*Hawaii Sta. Rpt. 1906, pp. 61–88, pls. 4*).—Marine algæ are important in the diet of native Hawaiians, as they are in China and Japan. Some varieties are cultivated in addition to the abundant supply found native on the coast. The methods of gathering algæ, which are known in Hawaii as limu, the native methods of preparing and serving them, methods of preservation, native methods of cultivation, and other similar questions are discussed and analyses of 3 species made by R. A. Duncan are reported.

As regards composition, the marine algæ somewhat resemble green vegetables and according to the data summarized are especially useful for supplying bulk to the ration, while the algæ gelatins are also important in counteracting a tendency to constipation. "Mineral matters are needed for the formation of bones, teeth, and other tissues, and to fulfill other physiological functions. The algæ are rich in phosphates, chlorids, bromids, iodids, etc., and it seems probable that the mineral matter which they supply must be of importance to the body."

The native Hawaiians use these edible seaweeds to a great extent as salads and relishes. In the author's opinion, they are more palatable when used in other ways. As shown by culinary tests "many of the seaweeds when cooked in soups, gravies, or with meats, or made into jellies, are entirely free from . . . [any] disagreeable or peculiar flavor. If cooked too long, or too large a quantity is used in the soups or jellies, the flavor is apt to be strong, but if used in smaller quantities it is very delicate and pleasant. The writer has carefully tested a number of species, cooking them in a variety of combinations. They seem to be equally palatable when used either fresh or dried. The bleached seaweeds of course make the best appearing jelly and blancmange, and look best in the soups and stews."

Satisfactory results were obtained when mucilage was made from seaweeds and also with seaweed gelatin used as culture media in laboratory work. "If the tons of algæ wasting on our shores could be utilized for gelatin, glue, farina, etc., it would . . . add to the general wealth and prosperity of these islands and to the United States.

"Further experiments and analyses should be made by the Government to test the nutritive value of our algæ and to find the best methods of securing the greatest amount of gelatin from each variety. Enough has already been done to suggest the future value of our economic algæ if properly utilized."

A list of edible algæ of the Hawaiian Islands is appended to the report.

The chemistry of strength of wheat flour, T. B. WOOD (*Jour. Agr. Sci., 2* (*1907*), *No. 2, pp. 139–160, figs. 2*).—As the chemical composition of the gliadin and glutenin of strong and weak flours was found to be identical in all the samples examined, it seemed probable that the difference between strong and weak flours might lie in the physical rather than the chemical properties of their gluten.

"Since it is well known that the physical properties of proteids are profoundly affected by small quantities of acids, alkalis, and salts, the amounts of these substances in strong and weak flours were determined. In the few cases examined, it was found that the strength was associated with a high ratio of proteid to salts and weakness with a low ratio. It is suggested that the variation of this ratio may be the explanation of the different physical behavior of the gluten of strong and weak flours, and that this is the factor which determines that component of strength which governs the shape of the loaf and its power of retaining gas. This point is receiving further investigation.

"The factor which primarily determines the size of a loaf which a flour can make is quite distinct. The size of the loaf is shown to depend in the first instance on the amount of sugar contained in the flour together with that formed in the dough by diastatic action. It is proposed to measure this by incubating the flour with yeast and water, and collecting the carbon dioxid evolved during 24 hours. Particular attention should be paid to the rate of gas evolution in the later stages of the fermentation, as this is shown to be more directly connected with the size of the loaf. . . .

"The largeness of the loaf depends chiefly on the capacity of the flour to give off gas when fermented with yeast, especially in the later stages of dough fermentation, and the suggestion is made that shapeliness, and probably gas retention, are dependent on the physical properties of the gluten as modified by the presence of varying proportions of salts."

A comparison of various methods of estimating the baking qualities of flour, R. W. THATCHER (*Jour. Amer. Chem. Soc., 29 (1907), No. 6, pp. 910–921*).—From the results of the comparative tests reported, the author concludes that "no single test which was tried is capable of giving conclusive evidence as to the baking quality of flour. Any of the processes which have yet been suggested for testing flour must be supplemented by a baking test if final and accurate conclusions are to be reached.

"The baker's sponge tests appear to afford little evidence of value except in the case of low-gluten flours. Inasmuch as these tests require nearly as much actual work and fully as much care and attention as the complete baking tests, it appears that they may well be abandoned in favor of the latter."

Portuguese studies of flour, F. DA SILVA (*Rev. Chim. Pura e Appl., 1 (1905), pp. 262–265; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 9, p. 582*).—The analyses of flour reported were made to secure data for judging of the quality of Portuguese flour and its agreement with the legal standard.

Zwieback preparations, K. FISCHER and O. GRUENERT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 11, pp. 692–697*).—A number of compounds recommended by manufacturers as additions to zwieback cakes and other bakers' goods were examined and found to contain small quantities of soap. The authors state that in Holland and some other localities it has been a common practice to add a small amount of soap to such goods with the idea of lessening the amount of egg required to make goods light, etc. The data reported are discussed with reference to the detection of soap in bakers' goods.

Phosphoric acid in barley, W. WINDISCH (*Jahrb. Vers. u. Lehranst. Brauerei Berlin, 9 (1906), p. 36; abs. in Chem. Zentbl., 78 (1907), I, No. 19, p. 1439*).—According to the author's investigations, no phosphorus occurs in barley in inorganic form, although such phosphorus compounds are formed during sprouting and malting. If barley contains any mineral phosphoric acid, it is either unripe or has sprouted or been changed in character in some similar way. The change of phosphoric acid from organic to inorganic form is due to the action of an enzym. The nature of the organic phosphorus compound is not yet known, but the author intends to continue his investigations.

Ripening of oranges, W. D. Bigelow and H. C. Gore (*Jour. Amer. Chem. Soc., 29 (1907), No. 5, pp. 767–775, figs. 2*).—Studies of the proportion of pulp, seeds, and skin in oranges in different stages of growth, and the composition of the pulp, showed that the increase of pulp and skin during growth was much more rapid with the pulp than with the skin. "In regard to the changes in the pulp, the acid of the fruit and the cell-wall tissue, or marc, are formed early in the life history of the fruit and remain nearly unchanged in quantity during the subsequent development. The sugars increase gradually during the growth of the orange, sucrose and reducing sugar existing in approximately equal quantity.

"Storage of the fruit at room temperatures at all stages of its development results in slight loss of acid and of total sugar, a marked increase of reducing sugar, and a corresponding decrease of sucrose. The loss of acid and sugar noted above is to be explained as in the case of apples by the consumption of these substances as a result of the respiration of the fruit. The weight of marc remains practically constant, and the weight of acid appears to decrease slightly on storage during the various stages of the development of the orange."

Some tropical starches, E. Hess (*Ztschr. Allg. Österr. Apoth. Ver., 44 (1906), p. 25; Apoth. Ztg., 21 (1906), p. 57; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 9, p. 586*).—The starches studied microscopically were obtained from *Cariota urens*, dried bread fruit, *Alocasia macrorhiza*, *Inocarpus edulis*, and Conophallus.

Iron in vegetable and animal tissues, A. Mouneyrat (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 19, pp. 1067, 1068*).—The iron content of bread of different sorts, fruit, cows' milk, goats' milk, cereals, vegetables, egg yolk, and table salt is reported, the determinations being made by a method which the author considers very exact.

The amount of lecithin in egg yolk, A. Manasse (*Biochem. Ztschr., 1 (1906), No. 3, pp. 246–252*).—Moist yolk of hens' eggs, as shown by the investigations reported, contains on an average 9.41 per cent lecithin.

Changes in alimentary pastes containing eggs and their effect upon the determination of the egg content, A. Beythien and P. Atenstädt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 11, pp. 681–692*).—When alimentary pastes containing eggs were stored no change was noted in the total phosphoric acid. Lecithin-phosphoric acid diminished somewhat when the amount present was high. The alcohol-soluble phosphoric acid remained practically unchanged when the egg pastes were kept for 8 to 16 months. The fat content was not found to be dependent upon age, but the iodin number of the fat showed changes.

The edibility of animal spleens, E. T. Williams (*Amer. Med., 11 (1906), No. 6, p. 215*).—On the basis of personal experience, the author considers spleens of domestic animals palatable food. He points out that owing to their soft texture and the great number of blood corpuscles spleens spoil very readily.

Experimental greening of oysters, C. Sauvageau (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 17, pp. 919–921*).—As shown by the author's experiments oysters become green in color after feeding upon a diatom (*Navicula ostrearia*). The coloration is due not simply to the presence of diatoms on the colored portion, but to the fixation in the tissues of coloring matter derived from them.

Beverages, A. L. Girard (*Les Boissons. Paris, 1906, pp. 96, figs. 26*).—The manufacture, characteristics, and quality of beverages are discussed, these including wine, beer, vinegar, distilled liquors and similar alcoholic beverages, fermented milk products, liqueurs, and similar articles.

Further notes on the sodium content of grape wine, O. Krug (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 9, pp. 544–547*).—The reported data regarding the mineral constituents of wine have to do with the ratio of sodium to chlorin under the requirements of the German pure-food law, and particularly the influence of nitrate of soda on abnormal sodium content.

Further investigations on stored raspberry juice, R. Kržižan (*Ztschr. Offentl. Chem., 13 (1907), No. 10, pp. 181–184*).—From the analytical data reported and discussed the author concludes that provided fermentation has ceased there is no noticeable change where raspberry juice is stored for months without added preservative. Sterilizing at 80° is sufficient for preservation provided the bottles are sterile. The amount of acetic acid formed from the citric acid and alcohol present is certainly very small.

From the changes in color and aroma it was found that stored raspberry juice can entirely lose its color without loss of aroma, so that it is evident that these factors are not dependent one upon the other.

Coffee and estimation of its value, L. E. Sayre (*Trans. Kans. Acad. Sci., 20 (1906), pt. 2, pp. 37–43*).—The author calls attention to the fact that the caffein content of coffee varies considerably according to the locality in which it is grown, recent analyses made in his laboratory reporting a range of 0.08 to 1.97 per cent of this constituent. He believes that this fact is not properly appreciated in the selection of coffee. Studies of the volatile aromatic constituents of roasted coffee have been made, but recorded data are not regarded as sufficient for general deductions. Methods of coffee analysis are briefly discussed.

Judging paprika, R. Kržižan (*Ztschr. Offentl. Chem., 13 (1907), No. 9, pp. 161–165*).—Analyses of extracted and unextracted paprika are reported which were undertaken to secure data for judging the quality of this condiment. The author finds that the coloring matter present and the constituent which imparts the sharp taste may be readily extracted with alcohol, but that it is difficult to remove the paprika aroma by this means.

The use of binding material in sausage making, A. Behre (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 9, pp. 525–533*).—A summary and discussion of data on the use of so-called binding material in sausage making, with special reference to the relation of this topic to pure food laws.

The effect of different preservatives on chopped meat, A. Kickton (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 9, pp. 534–542*).—The effect of different preservatives on the keeping quality and color of chopped meat was studied. The recorded data showed that adding preservatives to chopped meat which was beginning to spoil removed the odor, which would, of course, facilitate the use of inferior material. The author believes that chopped meat should be made from fresh material and that no preservative should be added without the knowledge of the consumer.

Corn oil: Its possible use as an adulterant in lard and its detection, W. McPherson and W. A. Ruth (*Jour. Amer. Chem. Soc., 29 (1907), No. 6, pp. 921–926*).—Noted from another publication (E. S. R., 18, p. 1147).

German food laws. I, Handbook of food laws; II, Official methods for chemists, G. Lebbin and G. Baum (*Deutsches Nahrungsmittelrecht. Vols. 1, Handbuch des Nahrungsmittelrechts, XI+555; 2, Amtliche Untersuchungsmethoden für Chemischer, pp. 224, figs. 7. Berlin, 1907*).—The first volume, which is by both authors, contains a summary of German legal enactments regarding food adulteration, and the second, which is by Lebbin, the regulations for chemical examination of foods in connection with food adulteration.

Food inspection decisions, H. W. WILEY, F. L. DUNLAP, and G. P. MCCABE (*U. S. Dept. Agr., Food Insp. Decisions 77, pp. 6; 78–79, pp. 4*).—The topics covered by these decisions are certificate and control of dyes permissible for use in coloring foods and foodstuffs, the use of labels after October 1, 1907, and the collection of samples.

A preliminary communication on the toxicity of some anilin dyestuffs, G. M. MEYER (*Jour. Amer. Chem. Soc., 29 (1907), No. 6, pp. 892–909*).—Several commercial organic dyestuffs (curcumin S, tartrazin, naphthol red S, carmoisin B, naphthol yellow S, gold orange and ponceau 2R) were studied as to their general effects on dogs when administered in varying amounts and for fairly long periods (2 weeks).

"None of these dyestuffs under the conditions above indicated exhibited any marked degree of toxicity. There was only one fatal result, which may have been due to influences independent of the action of the colorant.

"The dyestuffs were all excreted, in part unchanged, with the feces and to a slight extent in the urine. Their presence was demonstrated in the bile but they were not secreted in the milk (bitch).

"Peptic digestion experiments have shown that these dyes like many other substances inhibit peptolysis in vitro. The interference noted may have been due to the associated inorganic matter."

A study of metabolism in a healthy vegetarian, W. G. LITTLE and C. E. HARRIS (*Bio-Chem. Jour., 2 (1907), No. 5–6, pp. 230–239*).—The income and outgo of nitrogen and iron, the urea content of the urine, and other factors were recently determined in the case of a man who, the authors state, had been a vegetarian for about 20 years, with favorable results to his health. Some data are also recorded regarding specific gravity and composition of the urine of the same subject at an earlier period on the same kind of diet.

As shown by the menus quoted, milk and eggs were used as well as vegetable foods. For the 14 days covered by the more complete investigation the average protein consumption was about 50 gm. per day. Thirty per cent of the nitrogen eaten was excreted in the feces. The average intake of iron as estimated for 7 days was 8 mg. per day and the output in the feces 3 mg. The subject weighed 127 lbs. and this weight was fairly constant. The exercise taken was apparently moderate.

A comparison of the excretion of inorganic constituents in the urine of the vegetarian and a gouty subject who ate meat was made. "The difference in calcium output is the most interesting fact [observed] . . ., especially when it is remembered that the total amount of urine execreted by the gouty patient was more than double that of the vegetarian. The figures suggest that perverted calcium excretion may be a factor in the pathogeny of gout, and that in gout an excess of calcium is being excreted by the kidneys, which under normal conditions would be removed by intestinal excretion."

The effect of a meat diet on fertility and lactation, B. P. WATSON (*Proc. Roy. Soc. Edinb., 27 (1906–7), No. 1, pp. 6–10, pl. 1*).—From experiments with white rats the author concludes that a meat diet is prejudicial to the occurrence of pregnancy in rats, and that in rats fed on a meat diet the mammary development of nursing mothers is less than in rats fed on bread and milk.

The influence of an excessive meat diet on the osseous system, C. WATSON (*Proc. Roy. Soc. Edinb., 27 (1906–7), No. 1, pp. 2–5, pls. 4*).—The investigations reported, which were made with white rats, led the author to conclude that "the bones of animals fed on an excessive meat diet present an appearance of delayed and imperfect ossification, with increased vascularity, and an increase in the number of red blood corpuscles."

The effect of diet on endurance, I. FISHER (*Trans. Conn. Acad. Arts and Sci., 13 (1907), pp. 1–46*).—The investigations here reported in detail have been noted from a summary previously published (E. S. R., 19, p. 63).

The effect of muscular work on weight, composition, and water content of organs of the animal body, F. ROGOZINSKI (*Biochem. Ztschr., 1 (1906), No. 3, pp. 207–228*).—Dogs were used as the subjects of experiments undertaken to study the effects of muscular work. Work was performed with a dynamometer.

According to the author's summary, neither the physical properties nor the chemical composition of the blood were modified during the work periods. The recorded data indicate that the water content of the organs of the body is diminished by long-continued work. The lowered body weight during the work periods is an indication that this supposition is correct. An increase in the size of working muscles and the heart was not noted, except in one test.

Experiments on the exhalation of water vapor, H. GUILLEMARD and R. MOOG (*Compt. Rend. Soc. Biol.* [*Paris*], *62 (1907), No. 16, pp. 874–876*).—In experiments with small animals (guinea pigs) on the effect of variations in atmospheric pressure and temperature, it was found that conditions approximating those of high altitudes were not favorable to the exhalation of water vapor.

The part played by free nitrogen in animal metabolism, C. OPPENHEIMER (*Biochem. Ztschr., 1 (1906), No. 3, pp. 177–182*).—A preliminary account of investigations from which the conclusion was drawn that free nitrogen is inert as regards body metabolism.

The selective function of the stomach during digestion in the light of recent investigations, A. SCHEUNERT (*Ztschr. Physiol. Chem., 51 (1907), No. 6, pp. 519–544, figs. 3*).—From the data summarized and discussed the author concludes that the stomach does not exert a selective function in digestion. All the materials leave the stomach in the same way. The more rapid disappearance of digestible materials is due to the absorptive power of the stomach.

The point where proteid cleavage begins in the body in fasting and feeding, E. FREUND (*Ztschr. Expt. Path. u. Ther., 4 (1907), No. 1, pp. 1–56*).—The experiments reported led to the conclusion that protein is first changed in the intestine to a condition in which it is readily resorbed, and further, that under usual conditions the greater part of the energy-yielding protein cleavage takes place there which has been supposed to take place in the body cells. The occurrence of putrefaction products, fat bodies, and iron and calcium salts in the intestine and feces during fasting probably indicates that material derived from the blood and cells undergoes cleavage in the intestine.

The behavior of ovomucoid in the body, K. WILLANEN (*Biochem. Ztschr., 1 (1906), No. 1–2, pp. 108–128*).—From a study of ovomucoid, the author concludes that it has the characteristics of a gluco-proteid and that when taken into the stomach it is oxidized and so very probably can be counted as a food proteid. When eggs are eaten this substance is utilized as it occurs preformed in fresh eggs and is not changed by cooking. Experiments showed that the carbohydrate group could be separated from ovomucoid by digestion with pepsin and by putrefaction. On the other hand, neither digestion with trypsin nor autolysis induced cleavage of glucose amin.

Concerning creatinin formation, J. SEEMANN (*Ztschr. Biol., 49 (1907), No. 2, pp. 333–344*).—On the basis of experimental evidence the author believes that creatinin may be formed from protein by cleavage. The work of other investigators is discussed as well as the results of his own experiments.

New reasons for believing that free sugar occurs in the blood, E. PFLÜGER (*Arch. Physiol.* [*Pflüger*], *117 (1907), No. 3–4, pp. 217–222*).—A summary and discussion of recent investigations which have to do with the occurrence of free sugar in the blood. A polemical article.

International catalogue of scientific literature. Q—Physiology (*Internat. Cat. Sci. Lit., 5 (1906), pts. 1, pp. VIII+839; 2, pp. 1095*).—The bibliography of physiology, including experimental psychology, pharmacology, and experimental pathology, is continued in this volume of the international catalogue (E. S. R., 16, p. 689). Part 1 is the author catalogue and part 2 the subject catalogue. The present volume contains material received between May, 1905, and May, 1906.

ANIMAL PRODUCTION.

Some observations and experiments on the natural and artificial incubation of the egg of the common fowl, A. C. Eycleshymer (*Biol. Bul. Mar. Biol. Lab. Woods Holl, 12 (1907), No. 6, pp. 360–374*).—A series of experiments on the developing chick showed that frequently variations in development were so great that the value of the results was materially decreased. The author attempted, therefore, to secure additional data regarding the effect of the position of the egg, turning the egg, cooling, ventilation, and moisture of the air.

Special attempts were made to secure uniformity with respect to size and other conditions in the Plymouth Rock eggs used. The eggs were tested by transmitted sunlight, and those in the same stage of development were selected for experimental purposes.

In tests undertaken to ascertain what position eggs occupy during natural incubation it was found that an oblique position was usual, but that this was a factor of little or no importance. The observations and experiments with artificial incubation on the other hand led to the deduction that when the supply of fresh air (oxygen) is inadequate the oblique position of the egg with the small end up brings the embryo in closer contact with the air chamber and is decidedly advantageous. When there is an abundant supply of fresh air there is little to gain in placing the eggs obliquely.

As shown by observations with nests having felt sides and concave glass bottoms, eggs are turned partially or completely by hens at least five times during any given day, which is much more frequently than has been supposed. "The hen turns the eggs in two ways. If a sitting hen be watched as she returns from feeding to sitting, it will be seen that she moves her body rapidly from side to side. Whether the object be to turn the eggs is uncertain. Probably the first object is to bring the surface of the body in the closest possible contact with the growing embryos. Accidentally or purposely she also turns the eggs. This is not only true of the hen returning from feeding, but also when on the nest, for she is frequently observed moving about and settling down with the same characteristic lateral movements. Sometimes there are so many eggs in the nest or they are so widely scattered that the hen fails to properly cover them. When such conditions occur the hen invariably uses her beak to bring the outlying eggs in contact with her body. Not only does she frequently thus turn the eggs, but also she very often reaches beneath her body and turns the eggs lying near the center of the nest. Why she does this is a question which awaits an answer." The experiments made with incubators indicated that frequent turnings, at least five, gave the best results.

In a study of the temperature of eggs with reference to incubation, a series of observations is reported on the daily temperature of hens. Special self-registering thermometers fastened to blocks with the upper surface egg-shaped, which were placed under the hens in the nests, were used, and also thermometers placed in the groin. By the first method the readings ranged from 101.5 to 106° F., and by the second method, in which the hens were disturbed and the temperature was consequently somewhat higher than normal, from 102 to 107.4°.

The temperature of eggs during incubation was also measured, special precautions being taken to insure the maintenance of constant temperature. The range in temperature noted was from 98 to 103°. "These observations show that the proper incubating temperature of the egg is about 100° for the first week, 101° for the second, and 102–103° for the final week."

From tests of temperature of incubators and eggs, the author is of the opinion that the most favorable temperature within the egg chamber of an incubator is close to 102–103° in the first half of the incubating period and 103–104° for the latter half.

"In any consideration of temperature the fact must be kept in mind that as the chick grows it gives off more and more heat, so that if an incubator of 200-egg capacity were entirely without artificial heating, the temperature would be much higher than that of the surrounding atmosphere; it consequently follows that less artificial heat is necessary during the later stages of incubation. The 102–103° in the earlier stages is largely artificial heat, while the 103–104° in the later stages would be the combined animal heat given off by the egg and the artificial heat supplied by the heat radiator."

In natural incubation the hens leave the nests from time to time for food and in this way the eggs are, of course, cooled. "It may be stated with a fair degree of certainty that the cooling of the eggs is due to the necessity of obtaining food, and in no way fundamentally affects the growth of the chick when there is an abundant supply of fresh air. There is not the least doubt, however, but what it has a beneficial influence in cases of poor ventilation, and since no incubator is supplied with too much, it probably is best to adopt the common practice of cooling the eggs. In so doing it would not seem advisable to cool the eggs for more than 20 to 30 minutes each day for the first 15 or 18 days."

In tests of the effect of ventilation on eggs it was found that in an incubator with special ventilation 85.7 per cent of the fertile eggs hatched and in an incubator without ventilation 44.3 per cent. The amount of ventilation necessarily involves a consideration of the moisture content of the air and daily hygrometer tests were made with a view to ascertaining the amount of moisture which exists in the nests. "It was found on the average that the egg during natural incubation loses about 13 per cent of its original weight. It was also found by experiment that the evaporation could be lessened until the egg lost but 9 per cent of its original weight and still give a healthy chick. It was likewise learned that evaporation could be increased up to about 20 per cent and the eggs give rise to perfect chicks. It would thus appear that the moisture in the incubator should be so controlled that it will allow the evaporation of about 13 per cent of the orginal weight of the egg."

Condimental stock foods, F. W. WOLL (*Wisconsin Sta. Bul. 151, pp. 40*).—Analyses were made of 30 samples of condimental stock feeds. The author calls attention to the fact that in most of the samples the ash content was high, ranging from 5 to nearly 50 per cent, owing to the presence of large quantities of inorganic materials, like common salt, Epsom and Glauber salts, lime carbonate, lime sulphate, iron sulphate, etc., common salt being present in the largest quantities. The protein content ranged from 2.25 to 52.38 per cent.

"Most of the stock foods do not contain more valuable feed materials than oil meal or even wheat bran, and many contain less, as might be expected when we consider the character of the materials entering into the composition of these foods. However, since the manufacturers do not make special claims for nutritive properties in their 'foods,' this fact is not very important, and the value of the condimental stock foods must be decided on the basis of the medicinal properties of the drugs [ginger, gentian, fenugreek, pepper, sulphur, and similar materials] contained therein."

Data regarding the character of the ingredients in condimental stock foods, the results obtained in feeding tests with such materials, and formulas for making such foods at home are summarized. The author's conclusions follow:

Stock foods are of no benefit to healthy animals when fed according to manufacturers' directions "either as to increasing the digestibility of the feed eaten or rendering it more effective for the production of meat, milk, wool, etc.

"They are of no benefit as a cure-all for diseases of the various classes of live stock; neither do they possess any particular merit in case of specific diseases, or for animals out of condition, off feed, etc., since only a small proportion of ingredients having medicinal value is found therein, the bulk of the foods consisting of a filler which possesses no medicinal properties whatever.

"Exorbitant prices are charged for these foods, as is natural, considering the extensive advertising the manufacturers are doing, and the liberal commissions which they pay agents and dealers. The large sales of stock foods are doubtless mainly to be attributed to these facts.

"By adopting a liberal system of feeding farm animals and furnishing a variety of feeds, good results may be obtained without resorting to stock foods of any kind. If a farmer believes it is necessary to feed stock foods at times, he can purchase the ingredients at a drug store and make his own stock foods at a fraction of the cost charged for them by the manufacturers. He will then have the additional satisfaction of knowing just what he is feeding, and of feeding a concentrated 'food' instead of one largely diluted with nonmedicinal ingredients."

Commercial feeding stuffs, J. L. HILLS and C. H. JONES (*Vermont Sta. Bul. 131, pp. 8, figs. 2*).—Of the 112 samples of commercial feeding stuffs examined under the provisions of the State law, 45 represented guaranteed goods (cotton-seed meal, linseed meal, gluten feed, distillers' dried grains, brewers' dried grains, molasses feed, alfalfa feed, hominy feed, cereal breakfast food by-products, and animal meals) and the remainder unguaranteed feeds, namely, wheat offals and home-grown provenders. Of 14 samples of cotton-seed goods 8 were below guaranty, as were also 4 of the 5 samples of distillers' grains, a sample of oat feed and molasses feed, and a sample of alfalfa meal. The mixed feeds, bran, middlings, red dog flour, and the provenders of local manufacture were found to be of good grade.

A large proportion of the samples were also examined as to their weed seed content and germination, and the viability of the seeds and character of the weeds tested in pot experiments. "The by-products of the oil mills, the distilleries and the breweries, of the glucose and hominy works, and of several flour mills passed muster; but a single oat feed, a guaranteed wheat (mixed) feed, and every molasses feed carried more or less weed seeds, and these were viable, able to germinate and flourish . . . save in one case. . . .

"The buyer of a ton of one brand of these molasses feeds purchased therein three weed seeds for every square foot of a hundred-acre farm. . . .

"It is a matter of common knowledge that there are sold yearly hundreds of carloads of wheat screenings (which being interpreted means in the main weed seeds screened from wheat prior to the milling process). Sheep and poultry handle them well; but the digestive system of neither horse nor cow is able to destroy them. To employ materials carrying viable weed seed in the mixture of 'dairy' or 'horse' feeds, even though they are plastered over with molasses, is little short of atrocity."

Kansas law regulating the sale of concentrated feeding stuffs, C. W. Burkett and J. T. Willard (*Kansas Sta. Bul. 146, pp. 217–224*).—The Kansas State feeding stuff law provides for the registration of concentrated feeding stuffs, analysis of samples by station officials, and an inspection tax. Violations of the law are punishable by fines.

The chemical composition of meadow hay from different Austrian farms in 1903, F. Hanusch (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 3, pp. 81–85*).—Sixty per cent of the samples analyzed were classed by the author as of medium quality and 40 per cent as inferior.

Poisonous beans, J. Hendrick (*Trans. Highland and Agr. Soc. Scot., 5. ser., 19 (1907, pp. 139–144*).—In recent years many cases of cattle poisoning have been reported which were traced to beans imported from Java. The author has studied the question of such poisoning extensively and summarizes his results in the present paper. As he points out, the beans contain a glucosid which liberates hydrocyanic acid when acted upon by enzym or when treated with acid. Boiling the beans destroys the enzym and renders them harmless. Similar poisonous properties have been attributed to Rangoon or Burma beans, and until definite information is forthcoming the author insists that such beans should not be used.

The use of sugar, sugar beets and their by-products as feeding stuffs in 1906, A. Schift (*Wiener Landw. Ztg., 57 (1907), No. 30, pp. 289, 290*).—A summary and discussion of experimental data on the use of these products in animal feeding, which shows that their importance is appreciated.

The influence of proteolytic enzyms in feeding stuffs, W. Grimmer (*Biochem. Ztschr., 4 (1907), No. 1, pp. 80–98*).—The autodigestion of horse beans, vetch, barley, and oats was studied in neutral, acid, and alkaline mediums. On an average 17.44 per cent of horse bean protein, 22.82 per cent of vetch protein, 8.90 per cent of oat protein, and 5.02 per cent of barley protein were, in experiments in vitro, rendered soluble by the ferments present in the raw material. The character of the protein cleavage products was studied as well as the amount.

The results indicate that proteolytic enzyms in oats and barley are similar and resemble tryptic ferment. Horse beans, the author concludes, contain only one proteolytic enzym, and vetch probably more than one.

The possible importance of the enzyms of uncooked foods in the feeding of man and animals is discussed and, in the author's opinion, the proteolytic ferments normally present may be, under certain conditions, decidedly valuable.

Feeding experiments at the zootechnic laboratory, L. Picollo (*Bol. Agr. [São Paulo], 8. ser., 1907, No. 2, pp. 64–71*).—A brief account is given of the purpose and aims of experiments undertaken to determine the relative digestibility and nutritive value of local-grown and imported feeding stuffs. The data recorded include the kind and amounts of feed eaten, the water drank, and the weight of the feces excreted. The tests were made with a mare, a mule, and a heifer.

Beef production, H. W. Mumford (*Urbana, Ill., 1907, pp. 209, pl. 1, figs. 24*).—In this volume, which is based largely on the author's extensive investigations carried on at the Illinois Station and which is designed as a text-book for class-room work and as a general reference handbook, the author discusses the purchase and characteristics of cattle for feeding purposes, the cost of feeding, rations suitable for different conditions, baby beef, Christmas beef, feeding for the home market, fitting steers for exhibition, cattle in the feed lot, buildings and other equipment for cattle feeding, insect enemies and diseases, breeding beef cattle for market, and related questions.

"The arrangement of matter is designed to suit the demands both of the actual cattle feeder and of the student; to serve both as a ready reference guide—a text adapted to the progressive pedagogic presentation of the subject in the class room and a treatise conveniently arranged in logical order for the general reader interested in the subject."

Economical rations in beef production, H. R. Smith (*Nebraska Sta. Bul. 100, pp. 40, figs. 14*).—Several feeds supplementing a basal ration of shelled corn, snapped corn, and corn stover were tested and the results discussed in comparison with earlier work, of which the present study is a continuation (E. S. R., 18, p. 362).

With wheat bran as a supplement to the basal ration the average daily gain per head was 1.76 lbs., with linseed meal 2.33 lbs., with cotton-seed meal 2.11 lbs., and with alfalfa hay 2.42 lbs. Each of the lots comprised 10 steers, and the tests covered 20 weeks. With these lots the grain ration was increased as the test progressed and during the last 3 months the steers were given all the grain they would eat, which was abut 25 lbs. per head. On a lighter feed of shelled corn (14 lbs. per head per day) with snapped corn, alfalfa hay, and corn stover a similar lot of steers fed 24 weeks made an average daily gain of 2.01 lbs. per head. With all the lots the range in feed eaten per pound of gain was from 13.73 lbs. with the oil meal to 19.25 lbs. with the lot fed wheat bran, and the cost of feed per pound of gain (making no allowance for gains made by pigs following steers) from 6.99 cts. with the lot fed alfalfa hay to 10.49 cts. with the wheat bran ration. In the case of the lot fed wheat bran there was a calculated loss, including pork made by pigs following steers, of $3.94. With the other lots there was a calculated profit ranging from $1.32 with the cotton-seed meal ration to $6.38 with the alfalfa hay ration.

Data are given regarding the profit obtained in feeding a light ration of shelled corn with snapped corn, corn meal, corn fodder, alfalfa hay, and corn stover, but the test is not reported in full.

Some of the general conclusions drawn from this test and earlier work follow:

"Alfalfa hay with corn alone gives large and profitable gains.

"The use of well-cured corn stover with alfalfa and corn, while it may not produce larger gains, will make the gains less costly because of its low market value, thereby increasing the profits over corn and alfalfa alone. . . .

"The results of 2 experiments indicate that linseed meal is a little more valuable than cotton-seed meal and much more valuable than wheat bran for supplementing corn when fed with prairie hay or corn stover.

"When alfalfa is made at least half of the roughness with prairie hay or corn stover, good gains may be made and at less cost than when no alfalfa is fed, the protein being supplied by the use of linseed meal. In other words, it is possible to grow protein on the farm at a price much below what it will cost on the market in the form of some commercial protein food. . . .

"The results of a single experiment in which but little more than half a full feed of corn was supplied two lots of fattening steers suggest the possibility of making a larger use of hay in finishing cattle for market than is ordinarily made and at less cost, especially where hay is relatively low and corn high in price.

"From a commercial point of view the results of this entire series of experiments go to show that cattle feeding can be made profitable when discretion is used in the selection of foods for the ration. . . . Good feeding will make our corn bring more as beef than when sold direct to the elevator companies, even though the selling price of finished cattle is not far in advance of cost price, as was true in many of these experiments. The importance of manure and the growing of alfalfa and clover as agencies contributing to the maintenance and increase of land fertility argue further for this mode of selling a larger part of our annual corn crop. The cattle industry deserves much greater attention in this State than has been given it in the past."

The bulletin also contains some illustrations showing prize winners exhibited at the International Live Stock Show, 1906, by the department of animal husbandry of the University of Nebraska.

Dried beet pulp for fattening steers, R. S. Shaw, and H. W. Norton, Jr. (*Michigan Sta. Bul. 247, pp. 157-165*).—In one of the 3 tests with steers or younger animals which are reported, corn meal and oil cake and dried beet pulp and oil cake 5: 1 were fed. In the other two tests the ratio of the two feeds to oil cake was 5:2. A ration of corn meal, dried beet pulp and oil cake 5:5:4 was also included in 2 of the tests. The coarse fodder consisted of clover hay or timothy hay with corn silage in 2 tests.

The 3 tests covered respectively 84, 112, and 120 days. On an average the daily gain per head on the corn meal ration was 1.466 lbs., on the beet pulp ration 1.441 lbs., and on the ration containing both corn meal and beet pulp 1.561 lbs. The cost of a pound of grain in the 3 cases was 8.87, 7.17, and 7.23 cts.

"The absolute gains produced by feeding beet pulp were practically the same as from feeding corn meal.

"The gains of the pulp-fed steers were in the nature of growth and development, the corn meal produced fat and finish. As a result, at the end of the feeding period, the corn meal steers were in better condition for market than the others.

"For growing animals, beet pulp produced the greatest gains. For animals in a condition for finishing, corn meal gave the most rapid gains.

"From this it would be safe to conclude that in the earlier part of the feeding period beet pulp could be fed in a larger quantity to advantage, because of its cheapness and at the same time ability to produce gain rapidly. During the finishing period it should, however, be replaced at least in a large measure by corn meal, which possesses more value for finishing purposes. The corn meal is a much more concentrated feed, hence its especial value for forcing at the close of the feeding period when beet pulp could not be used on account of the bulky character rendering it impossible to feed sufficient quantity for the best results. These trials show that a 1,000-lb. steer will not consume over 10 lbs. of dried beet pulp in a day."

Feeding calves with starch and skim milk, A. Gouin and P. Andouard (*Bul. Sta. Agron. Loire-Inf., 1905-6, pp. 48-51*).—According to the authors' extended observations much larger quantities of starch may be fed than the 50 gm. per liter of skim milk recommended by some other investigators.

Milk emulsion for calf feeding, G. Hangel (*Wiener Landw. Ztg., 57 (1907), No. 36, p. 347*).—When an emulsion of palm fat and skim milk was substituted for whole milk in calf feeding very satisfactory results were obtained, according to experimental evidence, which is briefly reported.

Experiments on calf feeding, A. Gouin and P. Andouard (*Bul. Sta. Agron. Loire-Inf., 1905-6, pp. 52-82*).—In the studies reported a number of different rations were fed, the feed being regulated in accordance with the weight of the animal at different stages of growth. Requirements for growth and maintenance and related questions are discussed. In the authors' opinion, powdered green bone of good quality, such as is used as a fertilizer, is a very valuable constituent of the ration for calves.

Tankage for hogs in cattle feed lots, B. E. CARMICHAEL (*Ohio Sta. Circ. 73, pp. 4*).—Definite information gathered from 45 Ohio cattle feeders showed that only 10 supplied other feeds than corn to pigs following steers. The remaining 35 feeders either supplied no feed in addition to what the pigs could gather or else fed them corn. As the steers are very largely fattened on corn it follows that the pigs are fattened almost exclusively on this grain. Tests were therefore undertaken to determine whether the prevailing practice can be improved.

Two lots of 7 steers each were fed a ration of shelled corn, cotton-seed meal, corn stover, corn silage, and mixed hay, while 2 similar lots were fed a dry ration made up of the same materials, with the silage omitted. For 63 days 3 pigs followed each lot of cattle. They were then replaced by 4 thinner pigs and the test continued for 56 days. In addition to what they could gather, 1 lot of pigs following the silage-fed steers and 1 lot following the steers receiving no silage, were fed ⅓ lb. per head daily of digester tankage.

Considering the test as a whole, the pigs fed the tankage gained 1,230 lbs. and those fed no tankage 808 lbs., a gain of 52.22 per cent in favor of feeding tankage.

"The tankage was fed in the form of a thin slop, once daily. It may be very conveniently fed in this manner and was greatly relished by the hogs, in fact, they exhibited an almost ravenous appetite for it. . . .

"It is possible that the tankage-fed hogs consumed somewhat more corn than did those which received no tankage. Definite data are not at hand in regard to this matter, since in each of the lots a small amount of the grain was left in the manure by the hogs. It seems certain, however, that the gains made by the tankage-fed hogs are cheaper as well as larger.

"While, on account of its cheapness as a carrier of protein and ash convenience for feeding, digester tankage was used in the work reported herein, it is believed that other feeds, such as linseed-oil meal, soy beans, skim milk, buttermilk, or middlings, would greatly increase the efficiency of the 'cattle hog' in making economical gains. Feeders need, however, to exercise keen discrimination in the purchase of feed stuffs, for there is a likelihood of a heavy demand for certain feeds making it possible for the manufacturers to raise prices beyond the amount justified by the feeding value.

"Further work is needed along this line to determine what feeds are best suited for this purpose, and in what amounts they should be fed."

This line of experimenting will be continued at the station.

Animal husbandry in Denmark, 1906, A. APPEL (*Tidsskr. Landökonom., 1907, No. 6, pp. 329–344*).—A general survey.—F. W. WOLL.

Cattle raising, VICOMTE DE VILLEBRESME (*Bul. Soc. Agr. France, n. ser., 39 (1907), May 1, Sup., pp. 377–388*).—The French cattle-raising industry is discussed with special reference to breeds, feeding, profits, and related questions.

Sheep on arable farms, J. WYLLIE (*Trans. Highland and Agr. Soc. Scot., 5 ser., 19 (1907), pp. 147–161*).—The data summarized have to do with the feeding, care, and management of sheep under local conditions.

Ostrich raising in Africa, D. KURCHOFF (*Tropenpflanzer, 11 (1907), No. 5, pp. 302–314*).—A summary and discussion of data regarding ostrich raising in Africa.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Investigations on the proteid requirement of milch cows, O. KELLNER (*Fühling's Landw. Ztg., 56 (1907), No. 17, pp. 589–593; Milch Ztg., 36 (1907), No. 40, pp. 469, 470*).—The author considers briefly some of the results obtained in metabolism experiments with cows, the object of which was to determine the minimum amount of food proteid requisite for the production of a definite quantity of milk. With a ration rich in carbohydrates and a supply of nitrogenous materials only equal to the total amount in the excretory products and in the milk, the cows continued for a long time to give a considerable quantity of milk of good composition, almost the whole quantity of digestible protein in excess of their maintenance requirements appearing in the milk. The author believes that though the results obtained indicate that milk-giving animals may be made to be especially economical of the protein in the ration, they do not warrant the use of such small quantities of protein in feeding.

Some attention is also paid to results obtained in experiments on the substitution of ammonium acetate for part of the digestible protein in the rations. With an abundance of carbohydrates in the ration the ammonium salt seemed to be able to take the place of some of the food proteid in milk production. The author suggests that it was "apparently converted into proteid in the chyme," perhaps through the influence of bacteria.

The effect of rations rich and poor in fat on milch cows (*Landw. Jahrb., 36 (1907), No. 4, pp. 724–738*).—In 3 corresponding feeding periods the rations contained 2.77 kg. of digestible protein and 12.20 kg. of digestible nitrogen-free substances per 1,000 lbs. of live weight, but in the first and third periods the quantity of fat was only 0.64 kg., whereas in the second it was 1.17 kg. The quantities of milk and fat produced daily by each of the 15 cows on these rations are given. From the results obtained, the conclusion is drawn that the effect of the one ration is the same as that of the other.

The effect of emulsified and nonemulsified food fat upon milk production, C. BEGER (*Landw. Vers. Stat., 67 (1907), No. 1–2, pp. 1–25*).—In continuation of previous work (E. S. R., 18, p. 171), the author fed 3 goats with whole milk as a typical emulsified fat, and with skim milk and melted butter fat as a source of nonemulsified fat. From the results of the experiments the conclusion was drawn that the fat as an emulsion in the form of whole milk had the greater influence upon the milk secretion. The effect upon the body weight of the animals was so small and so variable that no conclusion regarding it could be drawn.

Should concentrated feeds be fed wet or dry? LEITHIGER (*Sächs. Landw. Ztschr., 55 (1907), No. 25, pp. 693–695*).—From the better milk production and gain in body weight obtained in experiments with 8 cows fed their concentrates for one period wet and for another dry, the author concludes that it is more desirable to feed concentrates dry.

On the histology of the milk glands of the cow, P. LENFERS (*Ztschr. Fleisch u. Milchhyg., 17 (1907), Nos. 10, pp. 340–350; 11, pp. 383–390; 12, pp. 424–449*).—In these investigations, the author used tissues from the milk glands of cows of different ages, at different periods during pregnancy, at different stages in the lactation period, and of cows dry for different lengths of time. He describes his method of preparing the tissues for microscopical examination, and discusses his data with special regard to the condition of the milk glands before the birth of the first calf, during lactation, and during involution, comparing his own conclusions with the opinions of previous investigators. A bibliography is appended to the article.

Contribution to the knowledge of the composition of the fat of cow's milk, W. FLEISCHMANN and H. WARMBOLD (*Ztschr. Biol., 50 (1907), No. 3, pp. 375–392*).—As reckoned from the quantities of glycerin and volatile and nonvolatile fatty acids determined in 4 samples of milk fat, the elementary composition of the fat averaged 75.25 per cent carbon, 11.86 per cent hydrogen, and 12.89 per cent oxygen. In the average of 26 analyses of 9 samples of lactic acid-free pure milk fat separated by melting, the elementary composition was 74.78 per cent carbon and 11.46 per cent hydrogen.

On the spontaneous separation of a casein compound from milk, L. Preti (*Ztschr. Physiol. Chem., 53 (1907), No. 3–5, pp. 419–426*).—In milk preserved a year by the addition of chloroform, a rich white precipitate formed in the bottom of the flask without changing the reaction of the milk. Upon investigation this precipitate was considered to be a mixture of calcium phosphate and calcium caseinate. The author could not determine the nature of the casein, whether acid casein or rennet casein, and therefore could not decide whether the gradual separation of the precipitate occurred as a purely physical phenomena or under the action of a ferment.

The action of dilute acids upon casein, L. L. and D. D. Van Slyke (*Amer. Chem. Jour., 38 (1907), No. 4, pp. 383–456, figs. 14*).—This has already been abstracted from another source (E. S. R., 19, p. 173).

The hydrolysis of the sodium salts of casein, L. L. and D. D. Van Slyke (*Amer. Chem. Jour., 38 (1907), No. 5, pp. 619–626, figs. 2*).—This has already been abstracted from another source (E. S. R., 19, p. 174).

A contribution to knowledge regarding goat's milk and butter, H. Sprinkmeyer and A. Fürstenberg (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 6, pp. 388–391*).—The milk of each of 10 goats at the beginning of the lactation period was tested separately. The goats were milked at morning, noon, and evening. In the average of the data for 1 day the quantity of milk for the different milkings was respectively 969, 522, and 668 gm., the lactodensimeter reading at 15° C. was 30.7, 29.0, and 31.1, and the fat content was 3.91, 4.95, and 4.38 per cent. In the butter made from the milk the refractive index at 40° C. ranged for the different animals from 41.1 to 44.3, the Reichert-Meissl number from 20.3 to 29.1, the saponification number from 226.1 to 242.4, and the iodin absorption number from 26.9 to 38.9.

Dictionary of dairying in all countries, B. Martiny (*Wörterbuch der Milchwirtschaft aller Länder. Leipsic, 1907, pp. XI+142*).—A collection of popular expressions and technical terms pertaining to dairying and also to cattle breeding in use in different countries, with explanations of their meanings.

Review of the work of the 1906–7 season, D. Cuddie (*New Zeal. Dept. Agr., Dairy Div. Bul. 10, pp. 52, pls. 13; Ann. Rpt. 1907, pp. 5–22*).—The purpose of this publication is merely to "furnish a general outline of what has been done by the division, with some observations on matters affecting the dairy industry."

Handbook of information regarding milk, H. Rievel (*Handbuch der Milchkunde. Hannover, 1907, pp. X+376, figs. 35*).—In this volume, which is virtually a text-book on milk, the author presents a considerable amount of data and other information of value to those interested in the production and distribution of milk. The book is divided into several sections, which discuss, respectively, the properties of normal milk as affected by differences in breed of cattle or in individuality, by age, feeding, disease, etc.; the dangerous qualities of milk owing to diseases of the cows; measures for the prevention of the dangers in the use of milk, such as sterilization and pasteurization; the use of milk as a food for infants and children, with special consideration of the various methods of preparing the milk; and various topics concerned in milk control. An appendix gives a number of examples of police ordinances for the regulation of the milk industry in several cities in Germany.

American milk and milk standards, W. Frear (*Proc. Conv. Nat. Assoc. State Dairy and Food Depts., 10 (1906), pp. 172–194*).—"The purpose of this paper is to present a few facts concerning the composition of American milk in its relation to the chemical limits fixed in American legal standards, and especially those of the United States standard."

After discussing data obtained from a great many sources, the author concludes, that "from all these facts it appears that in the United States the general supply of milk for household use has an average fat content of from 3.8 to 4 per cent; that when the herds are turned to pasture a reduction to the average extent of 0.2 or 0.3 per cent occurs in the fat, and that the daily variations of herd's milk below the average do not usually exceed 0.15 to 0.20 per cent. It furthermore appears that, while the lowland breeds are being more largely used in certain communities, thus reducing the average richness of the milk there produced, with proper care in the feeding and in the selection of the family strain of these breeds, the tendency toward such reduction can be kept from going to an extreme. Finally, a widespread movement toward higher fat standards is apparent in communities where the 3 per cent standard now appears.

"With respect to the solids, on the other hand, the tendency is to swing back from the higher standards of 13 per cent to a position of 12 or 12.5 per cent."

Third International Dairy Congress, held at The Hague, September, 1907 (*Hyg. Viande et Lait, 1 (1907), No. 9, pp. 428-432; Indus. Latt. e Zootec., 5 (1907), No. 18, p. 137; Indus. Lait. [Paris], 32 (1907), No. 38, pp. 693-698*).—The rules and regualtions of the congress, the programme for the different sections, and the resolutions finally adopted by the several sections of the congress on laws and regulations, industry, and hygiene, pertaining to dairying and dairy products are given.

A statute regarding the care of milk and various milk products in Brunswick (*Veröffentl. K. Gsndhtsamt., 31 (1907), No. 38, pp. 968-971*).—The ordinance of the city of Brunswick governing the inspection of milk and milk products, the designation and quality of different kinds, the care and handling of milk, the requirements to be observed during the sickness of milk producers' families or helpers, the care of milk vessels, and the punishment for violation of the statute are given.

City milk inspection, J. Q. EMERY (*Proc. Conv. Nat. Assoc. State Dairy and Food Depts., 10 (1906), pp. 89-95, figs. 3*).—The author discusses the results obtained in the examination of milk in a number of cities in Wisconsin, and calls attention particularly to the use made of the Wisconsin curd test which he designates as "the simplest, quickest, most practicable and effective method known, whereby the imperfections present in milk can be readily and accurately ascertained, not only by the butter maker and cheese maker, but by the city milk inspector and the housewives as well."

Perhydrase milk according to Much and Römer, H. STRELINGER (*Ztschr. Fleisch u. Milchhyg., 18 (1907), No. 1, pp. 15-21*).—The author gives the details of his application of the method of Much and Römer for the commercial production and distribution of perhydrase milk. He states that milk thus produced will keep for months, and that it can then be freed of its hydrogen peroxid and will be so little changed that it tastes like fresh raw milk. The article includes reports by different investigators on bacteriological and hygienic tests of the product and on the results of experiments in feeding the milk to infants.

The conservation of milk by hydrogen peroxid, C. PORCHER and E. NICOLAS (*Rev. Gén. Méd. Vét., 10 (1907), No. 115-116, pp. 345-358*).—The authors review the deductions from the research of different investigators regarding the use of this antiseptic for the preservation of milk, and conclude that there is still need for investigation before absolutely certain decisions can be made with reference to the desirability of its use, and that, as is true of any method of preserving milk, it should not be used in any case except when the milk is produced under strictly hygienic conditions.

The detection of formaldehyde in milk, C. L. PENNY (*Delaware Sta. Rpts. 1904–1906, pp. 38, 39*).—The presence of formaldehyde in milk when added in solutions as dilute as 1 part of pure formaldehyde to 100,000 parts of milk was detected by means of the hydrochloric acid and ferric chlorid test immediately after addition and up to 19 days after. The conclusion from the tests was that "any amount of formaldehyde capable of preserving milk from curdling can be certainly detected so long as it preserves the milk, and, as a practical question, this is all that could be desired."

The cost of food in the production of milk, J. SPEIR (*Jour. Bd. Agr.* [*London*], *14* (*1907*), *No. 6, pp. 321–334; abs. in Canad. Dairyman, 3* (*1907*), *No. 41, p. 672*).—The author discusses the data regarding food consumed and milk and butter fat produced that have been obtained by milk record associations in southwestern Scotland. According to the data obtained during the winter and spring months up to May, 1907, the average cost of milk per gallon (10 lbs.) was 8.72 cts.

Butter and milk tests at the Derby Show, 1906, E. MATHEWS (*Jour. Roy. Agr. Soc. England, 67* (*1906*), *pp. 189–201*).—Data obtained in tests of the quantity and quality of milk and butter yielded by several different breeds of cattle are reported. The results of 2 experiments in the dairy are also given, in one of which the author believes he ascertained that the public generally do not know the taste of genuine unadulterated butter, and in the other he demonstrated that the method of ceasing to churn when the butter is in a granular condition was preferable to that of churning the butter into a lump.

Butter, 1906–7, T. MACFARLANE (*Lab. Inland Rev. Dept.* [*Canada*], *Buls. 131, pp. 15; 133, pp. 4*).—Bulletin 131 is a report of the results of analyses of 101 samples of butter collected in 1906. Of these, 90 samples were found to be genuine, 4 doubtful, and 7 adulterated. Bulletin 133 gives the results of an examination of 881 samples collected in 1907. From the butyro-refractometer test, 868 were judged to be genuine butter, 5 were doubtful, and 8 contained foreign fat. The results of more complete tests of these 8 samples and 2 of the doubtful ones are given.

A comparison of anilin and anatto butter colors in butter making, E. H. FARRINGTON and M. MEYERS (*Wisconsin Sta. Bul. 152, pp. 19, fig. 1*).—Three brands of each class of colors were compared as regards the imparting of an objectionable flavor to the butter and the holding of the color when the butter is kept in cold storage. The conclusions drawn are as follows:

"First, some of the brands of vegetable butter color now on the market are weaker than the analin butter colors. Nearly twice as much vegetable color was needed in some cases to produce the same shade of color in butter as was given by the anilin color.

"Second, when the change was made from vegetable to anilin butter color, some 15 years ago, butter makers were so accustomed to the weaker anatto color that they added too much of the stronger anilin color. This had a tendency to gradually accustom the consumer to a more highly colored butter than formerly had been made.

"The natural color of June butter is a sufficiently high color, and when only enough vegetable color is added to produce this shade there will be no danger of using so much as to impart a butter color flavor to the butter.

"Third, the vegetable colors now on the market impart a rather greenish-yellow shade to the butter. This is quite different from the bright or reddish-yellow given to the butter by the anilin colors.

"Fourth, some brands of vegetable color contain a decided flavor, imparted to them by the oil used in making the color. This flavor may be distinctly noticed in the butter when large quantities of such brands of color are used.

"Fifth, a great improvement in the strength and flavor of certain brands of vegetable butter color was noticed during the year these experiments were conducted, which suggests that the vegetable butter colors may eventually be improved so as to compare favorably with the anilin butter colors.

"Sixth, when butter was held in cold storage at 5° below zero, no difference was noticed in the uniformity or the depth of color in the lots of butter to which anilin and vegetable coloring was added. Over 50 tubs of butter were held in storage for different lengths of time, some of them being taken out when the butter was nearly a year old. Neither the vegetable nor the anilin colored butter showed any indication of fading or changing color while in storage.

"Seventh, butter can be satisfactorily colored with a vegetable color."

The distribution of lactic-acid bacteria in curd and cheese of the Cheddar type, F. C. HARRISON (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 12 (1906), Sec. IV, pp. 83-87, pls. 5*).—The author briefly describes his investigations on the distribution of bacteria in Canadian Cheddar cheese and discusses, with illustrations, his microscopic examination of curd and cheese (1) at cutting time, (2) when cooking temperature was reached, (3) at dipping (running off the whey), (4) at milling, (5) at salting, and (6) in cheese 2 days old. The results confirm the conclusion from previous examinations, that "there is not an even distribution of bacteria throughout the substance of a cheese, and it would therefore seem necessary to modify somewhat our methods of analysis."

Regarding "short" cheese, F. W. J. BOEKHOUT and J. J. O. DE VRIES (*Rev. Gén. Lait, 6 (1907), Nos. 14, pp. 313-323; 15, pp. 345-351, pl. 1; Verslag. Ver. Exploit. Proefzuivelboerderij Hoorn, 1906, pp. 83-98, pl. 1*).—In the manufacture of Edam cheese the ripening process under some conditions yields a hard, chalky, crumbly product, known commonly as "short" cheese.

According to the investigations of the authors this results from an excess of free lactic acid in the curd during ripening. This may be due to faulty manipulation of the curd in the preparation for ripening, leaving in too much lactose from which the lactic acid may be produced, or to the action of certain specially active lactic-acid bacteria. The authors report data of several experiments in which cheese was ripened under the influence of 2 species of lactic-acid bacteria, one of rapid action and one of slow action. In each case the cheese ripened under the influence of the bacteria producing lactic acid in a relatively short time was faulty. The analyses of several of the faulty cheeses compared with a similar number of ordinary cheeses obtained from their experiments showed a much larger quantity of lactic acid in the "short" cheese than in the good cheese.

"Bitto" cheese, G. MELAZZINI (*Indus. Latt. e Zootec., 5 (1907), No. 18, pp. 138, 139*).—A brief article describing this kind of cheese, the importance of its production in different Alpine provinces, some factors of significance in making it, and remarks concerning its sale.

Milk and dairy products, G. MARPMANN (*Nahr. u. Genussmtl., 1 (1907), Abt. 1, pp. 297+VIII, figs. 232*).—This volume, which forms one part of a division, entitled Food Materials from the Whole Animal Kingdom, of a proposed handbook on food materials, discusses the nature and uses of milk and dairy products, and the processes and equipment used in their production.

Annual report on the investigations and progress of the manufacture of sugar, J. BOCK (*Jahresber. Zuckerfabrik [Stammer], 46 (1906), pp. XI+351, figs. 32*).—In this review of the literature of sugar making for 1906, chapter 1 is devoted to the agriculture and chapter 2 to the technology of sugar production. Chapter 3 deals with scientific and technical chemical investigations, the fourth chapter gives some account of patents relating to the sugar industry, and the final chapter contains various statistics, and laws of different countries, pertaining to the production, distribution, and consumption of sugar.

VETERINARY MEDICINE.

Action of various amins on bacteria, particularly the glanders bacillus, M. Nicolle and A. Frouin (*Ann. Inst. Pasteur, 21 (1907), No. 6, pp. 443–447*).—Various amins including piperidin have been shown to exercise a considerable power of destruction upon living proteid substances, particularly in bacteria. This matter was studied in the case of the glanders bacillus. It appears that when the glanders bacillus has been subjected to the influence of piperidin it retains its toxicity only toward animals which have been previously rendered abnormally sensitive to this organism.

Tetanus antitoxin, H. Vincent (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 23, pp. 1193–1195*).—In experiments with small laboratory animals it was found that tetanus antitoxin does not protect the animal against the development of an artificial infection even if administered within 1 hour after the animal has been removed from an autoclave maintained at a temperature sufficiently high to elevate the body temperature of the experimental animal. In cases where the antitoxin was administered immediately after the animal was taken from the autoclave the disease appeared in a chronic rather than in an acute form. These experiments present additional evidence of the influence of heat in rendering animals more susceptible to tetanus.

Accidents following upon vaccination against anthrax, A. Ascoli (*Rev. Gén. Méd. Vét., 10 (1907), No. 110, pp. 49–58*).—While signal success has attended vaccination against anthrax in the hands of expert veterinarians a number of accidents have occurred showing that the virus used for vaccination may vary in virulence at different times and under different conditions.

An investigation of the subject by the author indicated that the attenuated type of virus used in the Pasteur system of vaccination shows marked differential characters with regard to its virulence. On the basis of these observed differences it is possible to distinguish several qualities of virus. The virulence of the vaccine is not increased by passage through laboratory animals and the biological characters of anthrax virus in laboratory animals differ considerably from those of virus obtained from cattle dead of anthrax.

The author believes that anti-anthrax serum has the power of warding off serious troubles as the result of vaccination provided it is used before septicemia has appeared.

An experimental inquiry into the nature of the substance in serum which influences phagocytosis, G. Dean (*Proc. Roy. Soc. [London], Ser. B, 79 (1907), No. B 533, pp. 399–412*).—The results obtained in previous experiments by the author indicate that the sensitizing action of the serum may be due to the combined action of a thermo-stable and a thermo-labile substance, the former being comparable with the sensitizing substance of French authors, and the other resembling an alexin. The dilution of fresh unheated serum does not cause a diminution in the sensitizing power, at least for staphylococcus and tubercle bacilli until the concentration has been reduced to one-fourth. It appears that phagocytosis in dilutions ranging from $\frac{1}{4}$ to $\frac{1}{32}$ is proportional to the square root of the concentration of the serum. The phagocytic index shown by mixtures of heated immune serum and normal fresh serum is greater than either of these sera used separately.

Mammitis produced by acid-resistant bacteria, L. Nattan-Larrier and P. Bovéri (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 24, pp. 15, 16*).—In experiments reported in this paper 12 species of acid-resistant bacteria were used in inoculating laboratory animals for the purpose of comparing the lesions thus produced in the udder with those which occur in tuberculous infection.

When laboratory animals were inoculated in the udder with human tubercle bacilli a mammitis appeared on the fifth or sixth day and became most pronounced on the eighth to the tenth day. The acid-resistant bacteria on the other hand produced a mammitis much more quickly, but the disease while more intense persisted not longer than 9 days. Moreover, the tubercle bacillus produced a suppurative and ulcerative mammitis accompanied with swelling of the glands while these symptoms were absent in the apparently benign form of mammitis produced by acid-resistant bacteria.

Recent work on tuberculosis, T. Kitt (*Monatsh. Prakt. Tierheilk., 18 (1907), Nos. 8–9, pp. 385–411; 10, pp. 445–454*).—A general summary is presented of the more important recent literature relating to the problem of tuberculosis in animals and man, with particular reference to the types of tubercle bacilli observed in different animals, the possibilities of intertransmission, and recent work in vaccination.

Experimental tuberculosis in the guinea pig, A. Calmette, C. Guérin, and M. Bréton (*Ann. Inst. Pasteur, 21 (1907), No. 6, pp. 401–416*).—When either young or adult guinea pigs are fed virulent tubercle bacilli in a fine emulsion, infection invariably takes place. The lesions which develop after such a method of infection are ordinarily in the ganglions or lungs and seldom affect the abdominal organs. Occasionally lesions develop along the trachea. Tubercle bacilli killed by heat or by maceration in alcohol, and bacilli deprived of their waxy membrane, are still toxic for guinea pigs when taken into the alimentary tract.

If tubercle bacilli are killed by chemical substances or by heat and absorbed by the alimentary tract in minute doses and at sufficiently long intervals they confer a remarkable power of resistance toward infection with virulent tubercle bacilli. These effects were produced by using tubercle bacilli macerated for 10 days in an autoclave at a temperature of 37° C. in water containing 10 per cent of salt, or bacilli similarly treated with Gram's fluid, or bacilli subjected to a temperature of 100° C. for 10 minutes.

Transmission of tuberculosis in cases where the udder is affected, Witt (*Berlin. Tierärztl. Wchnschr., 1907, No. 25, p. 491*).—A cow, which upon examination after slaughtering showed evidence of general infection with tuberculosis with a pronounced lesion in the udder, had been used in furnishing milk for a family. In an examination of the family by a physician it was found that one of the children was affected with tuberculous lymphatic glands, believed by the author to be the direct result of drinking tuberculous milk.

A new method of experimental diagnosis of tuberculosis, H. Vallée (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 24, pp. 1383–1385*).—The author reports that if tuberculin be rubbed into scarifications of the skin a circular swelling appears around the spot within 36 hours. If the reaction is intense the swelling resembles the verrucose lesions of tuberculosis on the human skin. In drying, the swellings produce epidermal scales.

The penetration of the tubercle bacillus through the skin, J. Courmont and Lesieur (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 22, pp. 1143–1145*).—In experiments with guinea pigs, rabbits, and calves, the author found that the tubercle bacillus could penetrate the apparently intact skin and in almost all instances did so after the skin had been shaved over the area upon which the tubercle bacilli were rubbed. Infection produced in this way led to local skin lesions in some cases and in other cases produced the generalized form of the disease without showing any effect upon the skin. The cutaneous lesions appeared like lupus or scrofula. In rabbits the disease assumed the pulmonary form in a large number of cases.

Cutaneous reaction to tuberculosis, F. Arloing (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 22, pp. 1171–1173*).—Brief reference is made to other recent experiments in making a tuberculin test by rubbing the tuberculin in scarifications of the skin. The author comes to the conclusion that the cutaneous reaction to tuberculin is not constant.

Cutaneous reaction caused by different tuberculins and by human tuberculous serum, F. Arloing (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 23, pp. 1215–1217*).—A claim has been made by a number of authors that specific reactions may be obtained by rubbing tuberculin into scarifications of the skin of animals or human beings. The author tested this matter, using 4 tuberculins obtained from different sources. No specific reaction was obtained in the case of any of the tuberculins, and serum obtained from a tuberculous human being also failed to produce any reaction when rubbed into a skin wound in a tuberculous guinea pig.

Cutaneous reaction to tuberculin, H. Vallée (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 24, pp. 8, 9*).—The results obtained by different authors in rubbing tuberculin into scarifications of the skin have varied considerably. In explaining these differences the author believes that consideration should be had for the fact that some investigators have experimented with animals artificially inoculated with tuberculosis while others have worked upon spontaneous cases of the disease. The results obtained from tuberculin tests by the cutaneous method are more reliable in natural cases of tuberculosis.

Destruction of tubercle bacilli in milk, and vaccination against tuberculosis, E. von Behring (*Behringwerk Mitt., 1907, No. 2, pp. 100, charts 3*).—A general statement is given regarding the effectiveness of a mixture of 1 part formaldehyde and 12½ parts peroxid of hydrogen in destroying tubercle bacilli and other micro-organisms in milk, water, and other fluids. It is claimed for this disinfectant that in the proportions necessary for the disinfection of milk and water it is practically nonpoisonous.

With regard to the addition of formaldehyde alone to milk as a means of freeing the milk from tubercle bacilli the author declares himself in favor of the method with certain qualifications. It is recommended that the maximum amount of formaldehyde be properly made known and that the use of formaldehyde in the disinfection of milk be under strict sanitary supervision.

The greater portion of the pamphlet is occupied with a consideration of the results obtained from the use of bovovaccine, taurovaccine, and other products of the tubercle bacillus prepared and sold under the author's supervision.

The disposition to be made of the meat of animals showing tuberculous infection in the muscular lymphatic glands or bones, L. Marschner (*Ztschr. Fleisch u. Milchhyg., 17 (1907), No. 10, pp. 336–338*).—In the author's opinion if only one tuberculous focus is found in the spinal column by examination of the split surfaces, it is desirable to make a further examination of the tubular bones and of the structure of the vertebræ in order to determine the real extent of the disease. In cases where a few of the lymphatic glands of the muscles in one quarter are found to be affected, it is best to make a thorough examination of that quarter. In fact, the author disapproves of passing the quarter as unqualifiedly fit for human food.

Cattle trypanosomiasis in the Kongo Free State, J. E. Dutton, J. L. Todd, and A. Kinghorn (*Ann. Trop. Med. and Par., 1 (1907), No. 2, pp. 233–271, figs. 4*).—A trypanosomiasis of cattle, due to infection with *Trypanosoma dimorphon*, apparently exists everywhere in the Kongo Free State. In controlling this disease the author recommends that the transportation of cattle from place to place be forbidden as far as is possible and that special care be exercised in the choice of locations for cattle raising in areas where trypanosomiasis is known to occur. Native African cattle and various other domestic animals as well as wild game may acquire considerable immunity to the disease as the result of recovery from an infection.

Concerning the treatment of experimental trypanosomiasis, B. Moore, M. Nierenstein, and J. L. Todd (*Ann. Trop. Med. and Par., 1 (1907), No. 2, pp. 275–284*).—The use of strychnin in cases of infection with *Trypanosoma brucei* has no apparent effect upon the trypanosomes. Atoxyl followed by bichlorid of mercury gives quite satisfactory results, the combination being more effective than atoxyl alone. The experiments reported by the author were made on rats, but it is recommended that the treatment be tested in the case of animals and man infected with trypanosome diseases. Apparently the treatment must begin during the early stages of infection.

Trypanosome transmission experiments, J. E. Dutton, J. L. Todd, and J. W. B. Hanington (*Ann. Trop. Med. and Par., 1 (1907), No. 2, pp. 201–229*).—Experiments were made in the transmission of trypanosomes by tsetse flies. It was found that mammalian trypanosomes may be mechanically transmitted by the bites of various insects. During the development of trypanosomes spherical forms are produced by throwing off the undulating membrane and flagellum. These forms are found both in mammals and insects. The literature of the subject is discussed in connection with a short bibliography.

The transmission of Trypanosoma dimorphon by Glossina palpalis, E. Roubaud (*Ann. Inst. Pasteur, 21 (1907), No. 6, pp. 466, 467*).—Much circumstantial evidence has been accumulated to show that *T. dimorphon* has been transmitted by the agency of tsetse flies. The exact proof of this proposition, however, is not very extensive. The author obtained positive evidence of the agency of *G. palpalis* in transmitting the blood parasite in two instances.

The function of the spleen in trypanosomiasis, A. Laveran and Thiroux (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 1, pp. 14–17*).—It has long been contended that the spleen exercises a beneficial effect in the control of diseases caused by infection with trypanosomes. Experiments undertaken by the authors show that trypanosomes as found in the spleen have exactly the same appearance as those obtained from the general blood circulation. The extract obtained from the spleen exercised no effect upon trypanosomes and the progress of the disease did not appear to be affected by the removal of the spleen. It is possible that the spleen assists in removing the débris caused by the destruction of the red blood corpuscles, but its function so far as trypanasome disease is concerned appears to extend no farther.

The normal temperature of cattle, Kettner (*Ztschr. Veterinärk., 19 (1907), No. 7, pp. 328–331*).—Temperature records were kept as taken at noon and in the evening on 200 adult nonreacting cattle, 91 yearling nonreactors, 30 yearling reacting animals, and 503 adult reacting animals. In adult nonreacting cattle the temperature at midday ranged from 38 to 40° C. The temperature of adult reacting cattle had the same range. The variation in temperature of yearling nonreacting cattle was from 38.5 to 40.6° C. and of yearling reacting cattle from 38.5 to 40.1° C.

The author concludes from these observations that the basal temperature of reacting and nonreacting cattle is the same. As a rule the temperatures of both reactors and nonreactors become slightly higher toward evening. It is believed to be safe, however, to look upon a temperature of 40.1° C. as physiological, provided no recognizable symptoms of disease appear.

A prophylactic method of vaccination against foot-and-mouth disease, J. Oay (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 12, pp. 302–308*).—Attention is called to the similarity in the nature and location of the lesions in foot-and-mouth disease and cowpox. As is well known, both of these diseases are transmitted by filterable virus and the micro-organism is not known in either case. The author suggests the possibility that cowpox is a benign form of foot-and-mouth disease. A number of experiments were made during which a vaccine obtained from horses affected with horse pox was used in vaccinating cattle to protect them against foot-and-mouth disease. An immunity of considerable strength was thus produced and the author hopes that this method may prove of some economic importance.

Regulations for government veterinarians in lower Austria (*Tierärztl. Zentbl., 30* (*1907*), *No. 18, pp. 293–298*).—In a discussion of the matter of orders for government veterinarians, together with copies of such regulations in force in lower Austria, it appears that Austria is at present free from foot-and-mouth disease. This fact is learned from a compilation of the reports of various veterinarians, and the condition is believed to be due to the strict regulation of cattle traffic which has been enforced during recent years.

The licking disease of cattle, R. OSTERTAG and N. ZUNTZ (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2* (*1907*), *No. 6, pp. 409–424*).—The present article is a preliminary report of an investigation undertaken for the Royal Prussian Ministry of Agriculture to determine the cause of the so-called licking disease of cattle.

The results obtained during this investigation indicate that the use of swale hay from native meadows may produce the disease in cattle. The effect seems to be more pronounced after feeding hay from native meadows which have been somewhat improved by cultural methods. The poisonous effect of hay is not equally strong in all years. Apparently the poisonous principle of the swale hay produces a metabolic disturbance particularly in the formation of blood and bones, and, secondarily, a tendency to gnaw and lick all sorts of objects is observed in affected cattle. The nature of the poisonous principle has not been determined. Horses may be safely fed hay which is injurious to cattle. The harmful character of the hay may be entirely removed by steaming.

The development of Piroplasma bigeminum, D. KORSAK (*Arch. Vet. Nauk* [*St. Petersb.*], *37* (*1907*), *No. 4, pp. 315–320, figs. 62*).—It is by no means certain that all of the developmental stages which occur during a complete life cycle of the blood parasite of Texas fever have been made known and arranged in their true sequence. The author has followed the development of this parasite and presents the various stages by means of drawings with explanations in the order in which the different forms occur.

Notes from practice, KIRCHER (*Wchnschr. Tierheilk. u. Viehzucht, 51* (*1907*), *No. 26, pp. 501–504*).—Observations were made on the effect of a 2 per cent creolin dip in treating sheep for scab. It was found that while less dip was required after shearing, the results of dipping were not so satisfactory as when done while the sheep were in full fleece. In several cases a second application of the dip failed to cure the sheep of scab.

Brief notes are also given on irregularities of parturition in domestic animals.

Bare-lot v. grass-lot in relation to stomachal and intestinal parasitism of lambs, W. H. DALRYMPLE (*Louisiana Stas. Bul. 95, pp. 23, pls. 5, figs. 2*).—In previous experiments at the station the bare-lot method greatly reduced the prevalence of nodule disease in lambs, but stomach worms still occurred. The experiment was repeated with treatment added for stomach worms. Four of the experiment ewes received each 4 oz. of a 1 per cent solution of coal-tar creosote and the other 4 received each a mixture of 1 dram carbon bisulphid and 1 dram absolute alcohol in 4 oz. of milk. These treatments were repeated

3 days later, substituting carron oil for the alcohol and milk. The lambs on the grass-lots had similar treatment. The experiment began on March 15, and on August 10 the lambs were slaughtered.

All lambs on the bare-lot were in marketable condition, while only half of the lambs on the grass-lot were in condition. The former were in every way more satisfactory. The bare-lot did not prevent infestation of the lambs with stomach worms, but greatly reduced the number of nodule worms. Rotation of pastures is probably the best method of dealing with stomach worms. Carbon bisulphid gives rather better results as a vermifuge than coal-tar creosote.

The etiology of hog cholera and swine plague, F. Hutyra (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 4–5, pp. 281–309*).—Reference is made to the recent work of American and German investigators who have shown that hog cholera may be caused by filterable virus supposed to contain an ultramicroscopic organism. On account of the close connection which seems to prevail in most outbreaks of hog diseases between hog cholera and swine plague, the author undertook a series of experiments for the purpose of determining whether swine plague might also be due to a filterable virus. The results of these experiments, together with theoretical considerations based on other investigations and the known facts in connection with hog cholera and swine plague, indicate that swine plague is primarily due to the action of a filterable virus.

The author concludes that after primary hog cholera infection has been established in a hog, it may be possible for the characteristic anatomical symptoms of hog cholera or swine plague, or both, to develop secondarily as a result of the action of *Bacillus suipestifer* or *B. suisepticus*. It is believed, therefore, that the anatomical hog cholera and swine plague, whether occurring simultaneously in the same animal or not, are both due to an ultramicroscopic micro-organism found in the filterable virus of hog cholera. These results indicate that hog cholera and swine plague are different manifestations of the same disease, the variation of symptoms being due to the micro-organisms which secondarily infect the hogs.

The horse; its treatment in health and disease, J. W. Axe (*London, 1907, vol. 7, pp. X+188, pls. 14, figs. 92*).—In this part of the author's treatise on the horse, veterinary medicines are discussed and formulas are given for the preparation and administration of medicines in the treatment of animal diseases. The other subjects included in the volume are care of diseased animals, veterinary hygiene, examination of the air of stables, mineral and plant poisoning, and some of the more frequent operations of a surgical nature.

Fatal effects produced in horses by spoiled fodder, W. Zwick (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 4–5, pp. 310–340, pls. 2*).—Opportunity was had to observe a number of cases of the toxic effects of spoiled fodder upon horses, the symptoms in these cases resembling those of enzootic spinal paralysis. The water which the horses received was in satisfactory condition and stables were kept in a sanitary state.

Feeding experiments were made with hay which was apparently in good condition and which there was little reason to suspect. Those experiments indicated that the hay carried a pathogenic coccus which was tested in pure cultures in inoculating mice, rabbits, and horses. It was soon found that the hay in a fresh condition was not injurious, but that the pathogenic cocci became associated with it later partly perhaps as the result of decomposition.

Report of the commission for studying the amount of ergot to be permitted in oats, Bastide et al. (*Bul. Off. Gouvt. Gén. Algérie, 1907, No. 13, Sup., pp. 176–258, charts 19*).—It appears that ergot is so commonly found in oats as offered upon the market in Algeria that a commission was established to determine the percentage of ergot which could be present in oats considered merchantable according to the law. The committee organized and carried out two sets of experiments in feeding known quantities of ergot to 10 healthy horses.

In the first set of experiments 2.5 gm. of ergot were added daily to 5 kg. of healthy oats and fed to the horses. The effect of feeding this amount of ergot daily for 6 weeks was not marked in any of the horses in respect to weight, temperature, heart beat, or respiratory action. The committee were unanimously agreed on the fact that no effects were observed that could be definitely attributed to ergot.

Another set of experiments was carried out during which the horses received from 2.5 to 5 gm. of ergot daily. The results in this case were likewise of a negative character, and it appears that the quantity of ergot normally found in oats can scarcely be considered a serious matter.

Means of protecting veterinarians in the examination of glanderous horses, A. I. Spasski (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 4, pp. 324, 325*).—A brief description is given of a mask to be worn over the face and of other apparatus to be worn on the hands in order to protect the observer from possible infection with glanders during the examination of horses.

Septicemia hemorrhagica in mules, E. C. Webb (*Jour. Compar. Path. and Ther., 20 (1907), No. 2, pp. 97–100*).—Occasion was had to study a number of serious cases of disease in mules in India. The post-mortem lesions were those of acute septicemia and cultures almost pure were obtained of the organism of hemorrhagic septicemia from diseased horses and mules. It is believed, therefore, that these cases were instances of true hemorrhagic septicemia. This disease has heretofore been considered rare in both horses and mules.

Biliary fever in dogs, D. Hutcheon (*Agr. Jour. Cape Good Hope, 30 (1907), No. 6, pp. 764–774*).—A general historical account is presented of the investigation of this disease in South Africa. It has been shown conclusively that it is carried by *Hæmophysalis leachi* and that the blood parasite which causes it is *Piroplasma canis*. The symptoms and post-mortem findings are briefly discussed. A preventive vaccine has not been devised. Some benefit is derived from the administration of calomel and quinin to diseased dogs, and infestation by ticks may be to some extent prevented by treating the dogs' legs with oily substances which may repel the ticks.

Leucocytozon canis, S. R. Christophers (*Sci. Mem. Med. and San. Depts. India, n. ser., 1906, No. 26, pp. 16, pl. 1; 1907, No. 28, pp. 12, pl. 1*).—*Leucocytozoon canis* belongs to the hemogregarines and reproduces itself by the formation of true cysts containing each about 30 sporozoits. Encystment takes place in the cells of the bone marrow. After escaping from the cysts the sporozoits invade the mononuclear cells in the marrow. The parasite is essentially one of the bone marrow. It is probably carried by the dog tick, flea, mosquito, or some species of Hippobosca. In fact the development of the parasite has been followed by the author in the body of *Rhipicephalus sanguineus*.

A parasite found in the white corpuscles of the blood of palm squirrels, W. S. Patton (*Sci. Mem. Med. and Sanit. Depts, India, n. ser., 1906, No. 24, pp. 13, pl. 1*).—Hemogregarines of the type studied by the author were previously known only as parasites of cold-blooded animals. The species studied by the author is described as new under the name *Leucocytozoon funambuli* and is parasitic in the blood of *Funambulus pennantii*. The parasite is found in the body of a louse belonging to the genus Hematopinus commonly observed on the squirrel.

Note on the occurrence of flagellated organisms in the liver of the pigeon, W. Jowett (*Jour. Compar. Path. and Ther., 20 (1907), No. 2, pp. 122–125, figs.*

2.)—The liver in badly diseased pigeons exhibited swellings over its surface which contained peculiar nucleated bodies furnished with 1 or 2 flagella. Occasionally these organisms showed the presence of vacuoles. The author refers the organism to the genus Cercomonas.

Live stock and complete stock doctor. A cyclopedia, J. Periam and A. H. Baker (*St. Louis, 1907, pp. 1298, pls. 30, figs. 946, charts 2*).—The present volume includes a general popular account of the history, management, breeds, feeding, and diseases of horses, cattle, sheep, swine, goats, and poultry, together with a brief chapter on bee raising. A considerable number of the illustrations used in the volume were taken from prize animals at the Louisiana Purchase Exposition.

The modern abattoir; construction, installation, and administration, A. Moreau (*L'Abattoir Moderne; Construction, Installation, Administration. Paris, 1906, pp. XVI+477, figs. 90*).—In this volume particular attention is given to an account of the construction, installation, and management of abattoirs in France. It is maintained that too little attention has been given to the technique of construction in these abattoirs, a majority being modeled upon that at the Villette market. By way of comparison the structural details of abattoirs in other European countries are also considered.

Attention is also given to arrangements for slaughtering various animals, cold storage, accessory industries connected with abattoirs, sanitary management of abattoirs, and veterinary inspection of premises and animals.

Farm hygiene, P. Regnard and P. Portier (*Hygiène de la Ferme. Paris, 1906, pp. XII+477, figs. 171*).—The practical matters relating to hygiene of farm buildings, barnyards, water supply, feeding stuffs, and premises are discussed in considerable detail. The larger part of the volume is occupied with an account of infectious diseases of farm animals and practical methods by which these diseases may be held in check or prevented from occurring.

RURAL ENGINEERING.

Irrigation in northern Italy, II, E. Mead (*U. S. Dept. Agr., Office Expt. Stas. Bul. 190, pp. 86, pls. 4, figs. 2*).—This bulletin is the second part of the report of the observations on irrigation in Italy made by Doctor Mead in the summer of 1903, and deals with the section watered by the Adda and Adige rivers, taking up especially the legal and institutional phases of irrigation and describing the operation of canals controlled by the Government and those controlled by cooperative associations of water users.

The history and present status of the irrigation laws of Italy are given, with some comparisons with American conditions. The development of irrigation laws from the early Roman law to the present time is sketched and a statement of the present law, enacted in 1884, is given. The unification of Italy as a kingdom made the National Government the successor to all the water rights which had hitherto belonged to the separate provinces, and one of its first acts was the declaration of the public ownership of all unappropriated public waters. This was followed by the enactment of a law providing for the determination of what are public waters and the compiling of a list of all rights to these waters, and making provision for the acquiring of rights in the future by grant only.

Concessions are now granted either by a law of the Kingdom or by an administrative decree, and are always made subject to existing rights. As a rule they are limited to thirty years, but perpetual rights may be granted by a law of the Kingdom. While the law makes the nation supreme in matters relating to the granting of rights for irrigation, it entrusts the exercise of this authority to local officials in the granting of rights of only local interest. This division of power has not, however, been satisfactory, at least to the officials of the General Government, and a commission was appointed in 1898 to recommend changes in the existing law. This report shows that the reason assigned for the appointment of the commission was the claim that the provincial officials were not exercising the proper care in the granting of rights, especially for the development of power, but were allowing power rights to get into the hands of foreign capitalists, who were establishing a monopoly for the exploitation of the real users of water. The proposed cure for this threatened monopoly of natural resources was to give exclusive authority to grant such rights to the General Government. This commission recommended the creation by law of a permanent board to which all such applications should be referred. No such law has been enacted, but a commission formed on the lines recommended has been created by royal decree, which, however, acts in an advisory capacity only.

The Kingdom of Italy charges for water diverted from public streams, the amount of the charges being fixed by law. The charges for water for drinking and for irrigation without the obligation to return the waste water to the stream is $2.83 per cubic foot per second per year, while the charge for the same quantity with the obligation to return the waste water is but one-half as great. Where it is impracticable to measure the water diverted the charge is 40 cts. per acre irrigated. The place of use of the water is not limited, the lessee having the right to use the water or to sublet without limit on the prices.

In addition to controlling the streams the Government owns certain canals which are leased as a whole, and other canals which are operated by the Government with leases to associations of water users or to individuals.

Further aid to irrigation is given by the Government contributing to the cost of construction of works built by associations or individuals. This aid is conditioned upon contributions by the provinces and communes where the works are situated, these local contributions being not less than one-tenth of the sum granted by the Government. The aid given by the kingdom is a part payment of the interest on money borrowed to carry out the work. The total contribution is usually 3 per cent of the estimated cost of the work annually for the first ten years, 2 per cent per year for a second period of ten years, and 1 per cent per year for a third period of ten years. This aid may be given to enlarge or complete works as well as for new works.

The Government further aids irrigation by granting loans from State banks. The procedure for making these loans, the amount of interest to be charged, and the security to be demanded are all fixed by the minister of finance. The maximum period of loans is ten years, except where a sinking fund is provided, when the maximum period is 25 years.

Associations for the construction of irrigation works through government aid are provided for by law. The associations may be either voluntary or obligatory. Obligatory associations are organized by the courts on the application of a majority of those interested and are in fact similar to irrigation districts or drainage districts in this country.

The report describes the operation of a typical government canal and of two association canals, illustrating the operation of these laws.

Irrigation and drainage laws of Italy, R. P. Teele (*U. S. Dept. Agr., Office Expt. Stas. Bul. 192, pp. 100*).—This bulletin gives the texts of laws which govern the securing of rights to divert public water, the organization of the associations for irrigation similar to our own irrigation districts, and government aid to irrigation. It includes all the drainage laws except special acts relating to individual projects. The regulations for the carrying out of these laws are also given.

Excavating machinery used for digging ditches and building levees, J. O. Wright (*U. S. Dept. Agr. Office Expt. Stas. Bul. 191, pp. 89, pls. 20, figs. 13.*—various types of excavating machinery used for digging ditches and building levees are described, and the conditions to which each is adapted are discussed, together with some general observations on ditching operations.

The only feasible way in which large areas of swamp land can be drained is stated to be by the use of a dredge. The cost ranges from 3 cts. per cubic yard up, according to the kind of dredge, the character of the work, and the efficiency of the management.

"Where there is much water on the surface or many trees and stumps to be removed, a floating dipper dredge is the best for work," while "for small ditches on firm ground some kind of traction machine is preferable. . . . A 1-yd. or 1½-yd. dredge seems to be best suited for ordinary drainage work.

"A floating dredge should commence at the upper end of the ditch and work down stream, and a traction dredge at the lower end and work up stream. When constructing large ditches having water flowing in them the greater part of the year, the slope of the bank is not of much importance, as nature will soon make the slope best suited to the soil. In small ditches, with water flowing only a part of the time, smooth, sloping banks and a true grade are very essential. . . .

"If a dredge is properly designed, well built, and suited to the work to be done, it is an efficient and cheap appliance for digging ditches or building levees." A clam-shell dredge with a long boom is well suited for the latter purpose.

"A machine can now be had which will dig from 70 to 100 rods of tile ditch 30 to 36 in. deep in a day of 10 hours at a cost of operation not exceeding $10 per day."

Tests of internal-combustion engines on alcohol fuel, C. E. Lucke and S. M. Woodward (*U. S. Dept. Agr., Office Expt. Stas. Bul. 191, pp. 89, pls. 20, figs. 13*).—This is a technical report giving the results of tests carried out for the Office of Experiment Stations in the mechanical engineering laboratories of Columbia University.

Eight different kinds of gasoline and kerosene engines of American manufacture were run on alcohol fuel as well as upon the fuels for which they were originally constructed, and careful observations were made of fuel consumption, power developed, and general behavior of the engines under different conditions of operation. Of these five were different slow-speed engines varying from 6 to 15 horsepower, and three high-speed engines, of which two were automobile engines and one a 2-cycle marine engine. The results of 192 consumption tests are given in detail, as well as many observations of a qualitative nature, and full discussions of the results are included.

The following general conclusions are drawn:

"(1) Any gasoline engine of the ordinary type can be run on alcohol fuel without any material change in the construction of the engine. The only difficulties likely to be encountered are in starting and in supplying a sufficient quantity of fuel, a quantity which must be considerably greater than the quantity of gasoline required.

"(2) When an engine is run on alcohol its operation is more noiseless than when run on gasoline, its maximum power is usually materially higher than it is on gasoline, and there is no danger of any injurious hammering with alcohol such as may occur with gasoline.

"(3) For automobile air-cooled engines alcohol seems to be especially adapted as a fuel, since the temperature of the engine cylinder may rise much higher before auto-ignition takes place than is possible with gasoline fuel; and if auto-ignition of the alcohol fuel does occur no injurious hammering can result.

"(4) The consumption of fuel in pounds per brake horsepower, whether the fuel is gasoline or alcohol, depends chiefly upon the horsepower at which the engine is being run and upon the setting of the fuel supply valve. It is easily possible for the fuel consumption per horsepower hour to be increased to double the best value, either by running the engine on a load below its full power or by a poor setting of the fuel supply valve.

"(5) These investigations also showed that the fuel consumption was affected by the time of ignition, by the speed, and by the initial compression of the fuel charge. No tests were made to determine the maximum possible change in fuel consumption that could be produced by changing the time of ignition, but when near the best fuel consumption it was shown to be important to have an early ignition. So far as tested the alcohol fuel consumption was better at low than at high speeds. So far as investigated, increasing the initial compression from 70 to 125 lbs. produced only a very slight improvement in the consumption of alcohol.

"(6) It is probable that for any given engine the fuel consumption is also affected by the quantity and temperature of cooling water used and the nature of the cooling system, by the type of ignition apparatus, by the quantity and quality of lubricating oil, by the temperature and humidity of the atmosphere, and by the initial temperature of the fuel.

"(7) It seems probable that all well-constructed engines of the same size will have approximately the same fuel consumption when working under the most advantageous conditions.

"(8) With any good small stationary engine as small a fuel consumption as 0.70 lb. of gasoline, or 1.16 lb. of alcohol per brake horsepower hour may reasonably be expected under favorable conditions. These values correspond to 0.118 and 0.170 gal. respectively, or 0.95 pint of gasoline and 1.36 pints of alcohol. Based on the high calorific values of 21,120 British thermal units per pound of gasoline and 11,880 per pound of alcohol, these consumptions represent thermal efficiencies of 17.2 per cent for gasoline and 18.5 per cent for alcohol.

"But calculated on the basis of the low calorific values of 19,660 British thermal units per pound for gasoline and 10,620 for alcohol, the thermal efficiencies become 18.5 for the former fuel and 20.7 for alcohol. The ratio of the high calorific values used above is, gasoline to alcohol, 1.78. The corresponding ratio of the low calorific values is 1.85. The ratio of the consumptions mentioned above is, alcohol to gasoline, 1.66 by weight, or 1.44 by volume."

Comparative values of alcohol and gasoline for light and power, J. B. DAVIDSON and M. L. KING (*Iowa Sta. Bul. 93, pp. 24, figs. 12*).—The investigations of which those here reported form a part were undertaken "for the purpose of making a comparison between (1) the heat value of the fuels, (2) their economy in the production of light, (3) their economy in the production of power, and (4) the relative safety of alcohol and gasoline for general use."

Studies of illuminating power were made with 3 forms of gravity lamps, a wick gasoline lamp, a pressure over-head generator lamp, and an ordinary kerosene lamp. The tests of power production were made with 3 different makes of gasoline engines having ordinary compression pressures. It was found impossible to secure an engine especially designed for alcohol, "and it was further found practically impossible to properly alter the design of any of the larger gasoline engines found in the laboratory for the most advantageous use of alcohol."

The results obtained are summarized as follows:

"(1) The higher heat value of 94 per cent alcohol is but 68 to 71 per cent that of gasoline.

"(2) The lower heat value (the value more nearly attained in practice) of 94 per cent alcohol is but 66 per cent to 69 per cent that of gasoline.

"(3) When used for the production of light, 94 per cent alcohol will produce from 53 per cent to 85 per cent as much light as an equal volume of gasoline

"(4) Alcohol of 94 per cent purity must be sold for from 11 to 17 cts. per gallon to compete with gasoline for lighting purposes at 20 cts. per gallon (the present retail price of gasoline in Ames).

"(5) Alcohol, when used in a generator lamp, will produce from two to four times as many candle power hours as kerosene in a wick lamp.

"(6) It was found impossible to soot the mantels of any of the lamps with alcohol.

"(7) Alcohol of 94 per cent purity, when used in engines designed for gasoline, has but 68 per cent to 85 per cent the value of gasoline in the production of power.

"(8) To compete with gasoline at 20 cts. per gallon for use in gasoline engines, 94 per cent alcohol must be sold for from 13 to 17 cts. per gallon and 90 per cent alcohol from 11 to 15 cts. per gallon.

"(9) None of the engines could be started readily with alcohol, although a few could be started with less difficulty than others.

"(10) After having once been started with gasoline and warmed up, the carburetors as designed for gasoline vaporized the alcohol successfully, except in once instance.

"(11) No doubt the gasoline carburetor can be readily changed to permit the use of alcohol as well as gasoline in the same engine.

"(12) Experimental work does not include tests of the special designed alcohol engine which should show better economy in the use of alcohol.

"(13) Gasoline can not be used readily in a special designed alcohol engine using high compression on account of pre-ignition.

"(14) The odor of the exhaust of an engine when using alcohol is not as unpleasant as when using gasoline.

"(15) Alcohol is much more pleasant to handle.

"(16) There is much less danger from fire when using alcohol than when using gasoline, owing to the fact that alcohol does not vaporize as readily as gasoline and its flame may be extinguished with water.'"

Public-road mileage, revenues, and expenditures in the United States in 1904, M. O. ELDREDGE (*U. S. Dept. Agr., Office Pub. Roads, Bul. 32, pp. 100, figs. 2*).—This bulletin consists largely of data already reported for each State in Circulars 39–46 and 48–87 of the Office of Public Roads, but the results of the whole investigation are assembled for a more convenient study and discussion, "in order that such comparisons and deductions may be made as will aid the public in locating defects in our present systems of road management."

"In 1904 there were 2,151,570 miles of public road in the United States. Of this mileage, 108,232.9 miles were surfaced with gravel, 38,621.7 miles with stone, and 6,809.7 miles with special materials, such as shells, sand-clay, oil, and brick, making in all 153,664.3 miles of improved road. From this it follows that 7.14 per cent of all the roads in this country have been improved."

The total expenditures during 1904 amounted to $79,771,417.87. This is $37.07 per mile of public road, or $1.05 per capita.

RURAL ECONOMICS.

The present status of the international cooperative movement in agriculture, Paisant (*Rev. Gén. Agron., n. ser., 2 (1907), Nos. 4, pp. 183, 184; 5, pp. 235–237*).—Brief accounts are given of the International Agricultural Association for establishing the price of cereals, the International Institute of Agriculture, and the International League of Agricultural Cooperative Societies, a new society organized in January, 1907.

The organization, constitution, and aims of these different bodies are briefly discussed. Their purpose in general is to secure and disseminate information regarding the specific branches of agriculture in which each international body is interested and to secure greater returns to the producers of agricultural forms of wealth.

[Report on the mutual agricultural insurance societies in France] (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), Nos. 6, pp. 676–689; 7, pp. 787–794*).—This is the report of the minister of agriculture for 1906, and gives data to May 1, 1907.

The total number of mutual insurance societies in France on that date was 7,824. Of this number 6,730 were societies for insuring against loss of live stock, with 355,600 members carrying insurance on stock valued at 384,895,435 francs; 1,008 insured against loss from fire with 34,457 members carrying insurance on property valued at 291,334,850 francs, and 28 insured against loss from hail with 42,550 members carrying insurance on growing crops valued at 27,749,815 francs. Statistics are also presented of 58 other mutual insurance societies.

Agricultural warrants, R. Worms (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 5, pp. 438–449*).—The author discusses the operation of the law of July 18, 1898, legalizing the issuance of warrants for the securing of credit on agricultural products, implements, etc., and points out the beneficial features of the new law of April 30, 1906. Statistics show that from July 1, 1901, to December 31, 1903, there were issued 4,658 warrants securing loans of 15,293,036 francs, largely on crops. It is believed that, under the more favorable provisions of the new law, the farmers of France will continue in increasing numbers to use this form of obtaining credit.

The agricultural warrant according to the French law of April 30, 1906, H. L. Rudloff (*Fühling's Landw. Ztg., 56 (1907), No. 15, pp. 519–528*).—The author discusses the present law, compares its provisions with those of the law of 1898, and points out where improvement can still be instituted. While granting that the law of 1906 indicates a positive advance in behalf of the tenant farmer, the author believes it is not the final word on agricultural warrants, which are capable of further development along social, economic, and legal lines, particularly as regards the rights of lessors of farms.

Concerning credit for agricultural improvements, E. Cinquini (*Bol. Quind. Soc. Agr. Ital., 12 (1907), No. 16, pp. 743–747*).—The author discusses sections of the law of December 22, 1905, relating to the agricultural credit fund, shows how the operation of the provisions of the law relating to repayment is liable to embarrass rather than to aid the farmer who borrows to improve his property or to increase the production of crops, and makes suggestions as to wherein the law can be improved.

The improvement suggested consists in providing easier financial facilities and methods of procedure in the formation of societies relating to agriculture, and that the government itself supervise such funds in order to diminish the risk of loss and increase the likelihood of gain on the part of those who adopt this means of securing credit.

The real condition of cooperation in Germany, H. Crueger (*Rev. Econ. Internat., 3 (1907), No. 2, pp. 272–303*).—The author discusses the progress of the cooperative movement in Germany, with statistical data regarding the number and kind of societies, membership, value of products, extent of credit, etc., to the close of 1905. Agriculture is said to hold the most important place in the development of cooperation, to have overcome the greatest economic difficulties, and to have brought about great improvement in the condition of production.

The significance of agricultural cooperative societies in Germany, Grabein (*Ztschr. Agrarpolitik, 5 (1907), No. 6, pp. 234–246*).—The author shows that on May 1, 1907, there were 20,845 agricultural cooperative organizations in Germany and discusses the advantages of this movement in promoting the economic welfare of small farmers.

The progress of agricultural cooperation in Tunis (*Quinz. Colon., 11 (1907), No. 14, pp. 585–587*).—Two years ago mutual credit and agricultural cooperative societies were unknown in Tunis, but in 1907 there were 19 credit societies which had advanced to members on personal credit sums amounting to about 800,000 francs. Cooperative societies for the purchase of agricultural supplies and the sale of agricultural products were not instituted until 1906, but their progress is said to have been as remarkable as that of the credit societies.

[Yearbook of world economics, 1905 and 1906], R. Calwer (*Das Wirtschaftsjahr. Jena, 1906, pp. XXVI+347; 1907, pp. VII+341*).—These volumes for the years 1905 and 1906 give statistical data with discussions relating to labor, agriculture, mining, iron and textile manufactures, finance, etc., in comparison with similar data for preceding years.

The statistics on agriculture relate principally to the acreage, yields, prices, and exports and imports of wheat, rye, barley, oats, corn, and potatoes. In comparison with 1905, the data show in general an increase in 1906.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 9 (1907), No. 11, pp. 81–88*).—The usual statistical data on the condition, production, value, and prices of agricultural products in the United States and foreign countries are summarized and discussed.

Census of manufactures, 1905. Agricultural implements (*Bur. of the Census [U. S.] Bul. 75, pp. 31, dgms. 2, maps 2*).—This bulletin gives detailed statistics with discussion of the manufacture of agricultural machinery for more than half a century, and includes data on the number and value of implements used for tilling the soil, sowing or planting the seed, harvesting, and preparing crops for the market.

The value of farm implements and machinery in use on the farms of the United States in 1904 was $844,989,863, a gain of nearly $100,000,000 since 1900. In addition a large proportion of the labor-saving agricultural implements and machinery in use on farms in all parts of the world was of American manufacture. The value of agricultural implements manufactured in 1905 was $112,007,344, of which $20,721,741 worth was exported as compared with $22,749,635 worth exported in 1904.

[Agricultural statistics of Nebraska], J. J. Ryder (*Nebr. Bur. Labor and Indus. Statis. Bul. 11, pp. 26*).—Detailed statistical data on the acreage under crops and in orchards in 1907, and on the shipment of surplus agricultural commodities in 1906, including live stock, cereals, hay, and dairy, poultry, and miscellaneous products. The total value of shipments in 1906 was $186,303,454, a gain of $35,750,104 over the preceding year.

Agricultural statistics, 1906, R. H. Rew (*Bd. Agr. and Fisheries [London], Agr. Statis., 41 (1906), Nos. 3, pp. 167–333, dgms. 9; 4, pp. 335–443*).—Part 3 gives detailed statistics on the prices of agricultural products, supplies of live stock at markets, and the imports and exports of agricultural commodities for the year 1906. The imports of staple food products showed a slight gain per capita over preceding years.

The quantities of principal food products imported in 1906 were per head of population: Wheat 239 lbs., flour 36 lbs., potatoes 10 lbs., meat 47.3 lbs., butter and margarine 13.9 lbs., cheese 6.8 lbs., and eggs 52. The total number of eggs imported in 1906 was 2,264,887,000. It is claimed that the statistics show a growing dependence of the population upon supplies from abroad, but that the British colonies are in general gradually displacing foreign competition.

Part 4 gives detailed statistics of the acreage and yields of crops and number of live stock in the British Empire and foreign countries for 1906 in comparison with similar data for the two preceding years. The prices of agricultural produce in the chief colonial and foreign markets are included.

Report on agriculture for the Province of New Brunswick for the year 1906, L. P. FARRIS (*Rpt. Agr. New Brunswick, 1906, pp. 312+IV*).—The acreage and yields of crops and the output of dairy products for the year 1906 are reported and discussed. The papers and addresses on agricultural topics delivered at the sixth annual maritime winter fair, together with reports of the proceedings of the agricultural societies of the province, are included.

The economic relations of agriculture in North Schleswig, H. BACHMANN (*Landw. Jahrb., 36 (1907), No. 3, pp. 425–471*).—The author gives data derived from 16 farms ranging from 28 to 101 hectares (69.2 to 249.5 acres) in size and from 1 farm of 230 hectares (568.1 acres) as to the quantity of land under cultivation, the percentages of different crops grown, and the amount of capital invested which is differentiated and discussed under the titles of land, buildings, live stock, implements, and circulating capital, the percentage relations of the value of each form of capital to the others being pointed out. He also presents statistics on the cost of production and returns on investment and labor. In the latter case comparisons between the wages of hired labor and the members of the family, individually and collectively, are made.

Natal agricultural statistics [for 1906] (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 7, pp. 772–777*).—Tabulated data on the results of European farming in the colony including the acreage and yields of crops, the number of agricultural implements, machinery, accessories, and live stock owned by Europeans, the nature, quantity, and value of animal products, and the number, kind, and wages of farm laborers are reported.

AGRICULTURAL EDUCATION.

Report of committee on extension work, 1906–7 (*U. S. Dept. Agr., Office Expt. Stas. Circ. 75, pp. 16*).—This is the second report of the committee on extension work of the Association of American Agricultural Colleges and Experiment Stations. It embodies a compilation of information secured from 46 of the land-grant institutions concerning the extension work already undertaken by them, and recommendations by the committee that each of the colleges represented in the association organize as soon as practicable a department of extension teaching in agriculture, or, in case this is at present impracticable, that they appoint in each case a faculty committee to carry on this work.

The farmer's debt to science, F. W. BICKNELL (*Amer. Mo. Rev. of Reviews, 36 (1907), No. 2, pp. 186–194, figs. 10*).—This is a discussion of the short courses, extension work, county experiment stations, animal husbandry work, and domestic science teaching of the Iowa State College of Agriculture and Mechanic Arts.

Agricultural and industrial schools in Iowa, W. LOUDEN (*1907, pp. 23*).—This is an address before the Iowa manufacturers' meeting at Council Bluffs, June 7, 1907, in which the importance of the agricultural college to the farmer is dwelt upon.

Educating boys to be farmers, W. J. SPILLMAN (*Farm and Ranch, 26 (1907), No. 37, pp. 4, 5*).—An epitome of an address delivered at the Texas Farmers' Congress in July, 1907, in which the speaker notes examples of success in farming which he attributes to education and good management, and brings the American public school system to task for affording very little training which encourages boys to live in the country. He cites the agricultural colleges and the few agricultural schools as exceptions, but shows that in Texas, for example, if the State agricultural college were to attempt to provide a graduate for each of the 352,000 farms in the State once in 25 years, it would have to graduate 14,000 men from its agricultural course every year. This being manifestly impossible, he advocates the establishment of agricultural high schools with a little more practical work than is provided in the curricula of the agricultural high schools in Georgia. He would have four commercial establishments connected with each high school—a dairy farm of about 60 acres, an orchard and truck farm, a large poultry plant, and a general farm, all run as commercial enterprises, the work to be done entirely by the students in the high school during the first two years of their course, under the immediate supervision of trained instructors.

"At the end of these two years a boy should know how to milk a cow better than any farmer in Texas knows to-day; he should know how to prune a tree, and how to pack a box of fruit for shipment. During the third year the practical work of the high school student is that of the instructor of the first and second year students. During this year the student learns how to manage others—one of the most important things that a young man has to learn. During the fourth year the student should make working plans for every one of these four industries, and for a part of the year he should be the actual superintendent of each of them in turn."

The Macdonald movement for rural education. Evidence of J. W. Robertson before the select standing committee on agriculture and colonization, 1906–7 (*Ottawa, 1907, pp. 183–206, pls. 4, maps 2*).—Information concerning the Macdonald movement for rural education which was brought out in hearings before a select standing committee on agriculture and colonization, including statements concerning benefits to agriculture resulting from agricultural education and the educational institutions developed as a part of this movement, among which are manual training centers, school gardens, consolidated rural schools, the Macdonald Institute at Guelph, and Macdonald College at Ste. Anne de Bellevue.

Agricultural education, W. C. PALMER (*Ind. Farmer, 62 (1907), No. 32, p. 1, fig. 1*).—An appeal for the teaching of agriculture in the public schools and for the establishment of practical agricultural schools.

Agriculture in the common schools, J. G. HERRON (*Ann. Rpt. Ohio Bd. Agr., 61 (1907), pp. 180–184*).—This is a farmers' institute address in which some of the reasons for the movement of country people to the city are set forth, among these the influence of schools. The teaching of agriculture in the common schools is mentioned as one of the possible remedies for this condition, but it is pointed out that before this can be successfully accomplished the schools need to be improved in other ways.

Agriculture in the country schools, W. G. MILLER (*Ann. Rpt. Ohio Bd. Agr., 61 (1907), pp. 177–180*).—This is an address before a farmers' institute in which it is argued that country boys should receive some instruction in agriculture, which is regarded as the most important branch of industry. The purpose of such instruction is said to be twofold—to help meet the wants of the times by giving the boy an agricultural education and to keep him on the farm; but whether the boy stays on the farm or not, agriculture should be taught in order that he may be brought into touch with nature in all of her phases and may know something of this great industry upon which all trades and professions depend.

The Swiss horticultural school for women, L. HENRY (*Rev. Hort. [Paris], 79 (1907), No. 13, pp. 305–308, figs. 2*).—This is a description of the first Swiss horticultural school for women, which is located at Niederlenz, near Lenzbourg, in the canton of Argovie. The buildings and grounds are described and some account is given of the work of the institution.

Teaching of cookery to public elementary school children in England and Wales; special report by the chief woman inspector of the Board of Education, M. A. LAWRENCE (*London Bd. Ed., 1907, pp. 36*).—This is the first special report issued by the Board of Education upon the work of the various training schools for teachers of cookery and upon instruction in cookery actually given to children in the public elementary schools. In a prefatory memorandum a summary is given showing the regulations governing instruction in this subject and describing the work of training schools in domestic subjects. The report proper deals with the work actually being done in the different centers.

Nature study teaching, P. H. ARCH (*Agr. Econ., 40 (1907), No. 453, pp. 260, 261, figs. 2*).—A description of the exhibition of rural school work in nature study, gardening, agriculture, rural handicrafts, and literature at the royal agricultural show at Lincoln.

Suggestions for grain-growing contests, score cards, and rules for judging wheat, oats, and corn, C. P. BULL (*Univ. Minn., Dept. Agr., Rural School Agr. Bul. 2, rev., pp. 116, figs. 38*).—This is a revision of Rural School Agriculture Bulletin No. 2 (E. S. R., 17, p. 715) with the addition of data concerning barley, sewing, cooking, and vegetable and fruit growing.

Report of curator of school gardens, LOUISE K. MILLER (*Ann. Rpt. Bd. Ed. Cleveland Pub. Schools, 70 (1906), pp. 65–69, pls. 3*).—A report on the supervision of school gardens, improvement of school grounds, the propagating center at Rosedale School, exchange gardens, and lectures on gardening in the Cleveland public schools.

Syllabus of illustrated lecture on roads and road building (*U. S. Dept. Agr., Office Expt. Stas. Farmers' Inst. Lecture 7, pp. 16*).—The topics considered in this lecture, prepared by the Office of Public Roads of this Department, are methods of construction, location, drainage, earth roads, sand-clay roads, burnt-clay roads, dust preventives, hard roads, and road administration. An appendix includes a list of 41 lantern slides, designed to illustrate the lecture, a list of references to publications bearing on the subject, and a table showing the mileage and expenditures for public roads by States during 1904.

MISCELLANEOUS.

Sixteenth, Seventeenth, and Eighteenth Annual Reports of Delaware Station, 1904–1906 (*Delaware Sta. Rpts. 1904–1906, pp. 115*).—This contains a financial statement for the years ended June 30, 1904, 1905, and 1906, the organization list and reports of the chemist, horticulturist, assistant mycologist, and bacteriologist. The report of the chemist includes analyses of pigeon manure, cowpeas, corn, millet, clover hay, and marl. The remaining portions of these reports noting experimental work other than that previously reported in bulletin form, are abstracted elsewhere in this issue.

Annual Report of Hawaii Station, 1906 (*Hawaii Sta. Rpt. 1906, pp. 88*).—This consists of a general review of the work of the station during the year, reports of the entomologist and horticulturist, and papers on organic nitrogen in Hawaiian soils, and the economic seaweeds of Hawaii and their food value. These papers and most of the experimental data included in the reports are abstracted elsewhere in this issue.

Annual Report of Nevada Station, 1906 (*Nevada Sta. Rpt. 1906, pp. 31*).—This contains reports of the board of control, the director, and heads of departments. The director discusses the Adams Act and the work undertaken under it, and gives a list of the publications of the year, and a financial statement for the fiscal year ended June 30, 1906. The departmental reports contain notes on the work in chemistry, botany, horticulture and forestry, zoology and bacteriology, agriculture and animal husbandry, and entomology. The experimental work in agronomy is abstracted elsewhere in this issue.

Contents of and index to bulletins of the Bureau of Plant Industry Nos. 1–100, inclusive, J. E. Rockwell (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 101, pp. 102*).—This contains a brief introductory statement as to the various publications of the Bureau and the form of distribution, a list with tables of contents of Bulletins 1–100, inclusive, and an index to these bulletins.

Index to Farmers' Bulletins 1–250, C. H. Greathouse (*U. S. Dept. Agr., Div. Pubs. Bul. 8, pp. 148*).

[Report on agriculture in Fiji, 1906] (*Leg. Council Fiji Paper No. 13, pp. 16*).—A brief account is given of work carried on during the year at two experiment stations in Fiji, including trials of various crops and studies of insect pests and plant diseases, and of fertilizer experiments conducted on a number of estates, with analyses of the soils of one of the stations and meteorological records kept at Suva.

NOTES.

Alabama College and Station.—The resignation of A. J. Norman, assistant in horticulture, to engage in commercial orchard work in Nebraska, has been followed by the appointment of Percy F. Williams, a graduate of the Massachusetts College, to fill the vacancy.

Colorado College and Station.—George P. Weldon, assistant entomologist at the Maryland Station, has been appointed field assistant of the fruit investigations at Delta, vice E. P. Taylor, resigned to accept a position as entomologist with the Missouri Fruit Station. The college is to erect a two-story brick building 60 by 120 ft. for civil and irrigation engineering. The cooperative work in horse breeding has been reorganized under a new arrangement whereby both the station and this Department will devote an increased amount of funds to the project.

Connecticut State Station.—H. R. Stevens, a graduate of the University of Vermont, and K. G. Mackenzie, a graduate of Yale University, have recently joined the station staff as chemists.

Georgia College.—A cotton school for farmers was held January 6–17, which is believed to be the first of its kind. Lectures were given on the soil, fertilizers, the cotton plant, seed selection, cotton diseases and insect pests, feeding cotton by-products, and cotton machinery, together with practical instruction in cotton grading, cotton warehousing, and the handling of cotton seed. About 120 farmers were in attendance.

Substantial progress is being made in the erection of the new agricultural building. A dairy barn has been recently completed, and a barn is now under construction for the department of field experiments.

Hawaii College.—J. E. Roadhouse, of this Office, whose appointment as dean was recently noted, died November 28, 1907. W. T. Pope, a graduate of the Kansas College and head of the science department of the Honolulu Normal School since 1902, has been appointed acting dean, and will proceed with the inauguration of the institution and the organization of its work. It is now hoped to begin actual instruction February 1.

Idaho University and Station.—R. E. Hyslop, late of the Wyoming University and Station, has been appointed agronomist.

Purdue University.—The third State corn show and the first State fruit show were held on the university grounds in connection with the farmers' short course, January 13–18, through the cooperation of the respective State organizations with the university.

Iowa College and Station.—Recent appointments include C. A. Scott, of the Forest Service of this Department, to succeed H. P. Baker; J. F. Barker, a recent graduate of the Ohio University, vice E. B. Watson, who has accepted a position with the Bureau of Soils; and S. S. Fay, of the Ohio Station, who has been elected to the position of experimentalist in the division of soils.

Kansas College and Station.—*Industrialist* announces the appointment of J. C. Kendall, recently State dairy commissioner, as head of the department of dairy husbandry, and of D. M. Wilson, assistant in dairy husbandry, as dairy commissioner. December 14 was observed in the State as alfalfa day, over 250 meetings being held for the discussion of this topic. The annual farmers' institute at the college was held December 26 to January 4, with courses in judging corn, live stock and poultry, dairy testing, cooking, and sewing. The various State breeders' associations held meetings in connection with the institute. A novel feature was the boys' corn judging contest, participated in by about 400 boys who were the winners of local contests and were receiving the trip to the college as a prize.

Louisiana Stations.—B. W. Edgerton, of Cornell University, has been appointed plant pathologist to begin work February 1. H. P. Agee has been given leave of absence and will spend the sugar season in Porto Rico.

Maine Station.—G. M. Gowell has resigned from the station work, his resignation becoming effective January 1. The work in poultry breeding is to be continued by the station biologists.

Massachusetts Station.—E. Thorndike Ladd, first assistant chemist in the fertilizer division, has resigned to engage in commercial work, and has been succeeded by Philip V. Goldsmith, a graduate of the Michigan College. James C. Reed, a graduate of the University of Vermont, has been appointed second assistant chemist.

Michigan College and Station.—Plans have been completed for the new agricultural building to be erected on the former site of the barns, at a cost of approximately $125,000. The insectary has been completed and will be used for investigations in entomology, soil chemistry, and botany. An investigation of the so-called Grand Traverse disease of cattle, which was widely prevalent in the northwestern part of the Lower Peninsula, has resulted in the discovery that the continued anæmia usually resulting in starvation was due to a chronic impaction of the third stomach. The remedies worked out by the station have proved efficient in every case where applied before the animal was unable to stand, and the investigation has been concluded for the present.

Missouri University.—Dr. Albert Ross Hill, formerly dean of the College for Teachers of the University, and at present dean of the College of Arts and Sciences at Cornell University, has accepted the presidency to succeed R. H. Jesse, who is to retire under the Carnegie retirement fund.

Nebraska University and Station.—Press reports state that Chancellor Andrews has resigned from the university. C. B. Anderson and George Coupland have been elected to the board of regents, and E. M. Little has been appointed assistant in dairying. A heating plant costing $30,000 has been added to the equipment, and a home economics building, costing $70,000, and a judging laboratory for the school of agriculture, costing $30,000, are approaching completion. The judging laboratory contains two class rooms for stock judging on the first floor, a class room and laboratory for agronomy on the second floor, and a seed room on the third floor. The attendance in the regular course of the school of agriculture for the current year is approximately 300. A course in home economics is now being offered with 25 students in attendance.

North Carolina College and Station.—According to *Breeders' Gazette*, C. M. Conner, agronomist, has accepted a position as assistant commissioner of agriculture for the Philippine Islands.

Ohio University.—V. M. Shoesmith, agronomist of the Maryland Station, has been appointed assistant professor of agronomy.

Oklahoma College and Station.—Under the new State constitution the State Board of Agriculture is made the board of regents of the college and station. The personnel of the board, as recently appointed, is as follows: J. P. Conners (president), Canadian; J. P. Roetzel (vice-president), Watonga; R. F.

Wilson, Valliant; D. M. Robb, Atoka; G. F. Bryan, Perry; Ewers White (treasurer), McLoud; Dan Diehl, Hobart; R. S. Burns, Fountain; R. P. Lindsey, Choteau; J. C. Elloott, Pauls Valley; and S. D. Dennis, Wellston.

Oregon College and Station.—A. L. Knisely, chemist, has resigned to enter the service of the Bureau of Chemistry of this Department. He will be connected with the food inspection work of the Bureau, and ultimately will be located at the branch laboratory soon to be opened at Portland, Oreg.

Porto Rico Station.—One of the largest sugar companies in the Island is actively cooperating with the station in cane breeding, furnishing two men for this work. Canes of promise will be distributed among the planters for trial.

Rhode Island College and Station.—In the college Warren B. Madison has been appointed professor of animal husbandry, and Daniel J. Lambert instructor in poultry husbandry. Wilhelm B. Quantz, Ph. D., has been appointed assistant chemist in the station in succession to H. S. Hammond, whose resignation was recently noted.

South Carolina College and Station.—A substation has been established in Summerville, where 300 acres of land has been donated for the purpose by the Southern Railway Co., adjoining its lines. The expense of equipment and maintenance is to be defrayed chiefly from college funds derived from State sources. About $5,000 is now being expended in installing a drainage system. Special attention will be given to problems involved in the reclamation of swamp areas and their adaptation to farm homes.

The enrollment of the college is rapidly increasing, especially in agricultural courses, where 248 students are now pursuing the four-year course. A new dormitory has been recently completed at a cost of $50,000, to accommodate 100 additional students.

Vermont University and Station.—The dedication of Morrill Hall, the new agricultural building, took place December 11. The State Grange actively cooperated in the exercises, and N. J. Bachelder, master of the National Grange, made the dedicatory address. In this he recounted the varied interests making for rural progress, and emphasized the necessity of individual initiative on the part of the farmers for the fullest realization of their purpose. Governor F. D. Proctor made the presentation address, and President Buckham the speech of acceptance. Director Hills, Mayor Bigelow of Burlington, Dean Bailey of Cornell University, and State Superintendent of Education Mason S. Stone were also among the speakers.

Morrill Hall is a substantial two-story and basement structure erected at a cost of about $60,000. The basement is to be fitted up for the dairy school, a farm creamery, a milk testing laboratory, and a market milk room. The main floor will contain the offices of the dean and director, and of the animal husbandman, a library and horticultural laboratories, offices, and class rooms, and the second floor the chemical laboratories of the station, a number of class and lecture rooms, and a soil physics laboratory.

In connection with the dedicatory exercises a federation of New England agricultural college clubs was organized on lines similar to the American Federation of Agricultural Students, by delegates from Maine, Vermont, New Hampshire, Massachusetts, and Rhode Island. Among other activities it is planned to issue a monthly circular letter on the work done at each institution, and an effort will be made to develop this into a quarterly publication. The next meeting is to be held in the fall of 1908 at the dedication of the agricultural building of the University of Maine.

Virginia College and Station.—S. W. Fletcher, Ph. D., of the Michigan College and Station, has been elected director of the station and professor of experimental agriculture, and entered upon his duties early in January.

Washington Station.—W. H. Lawrence, assistant botanist, has been appointed superintendent of the Puyallup Substation, and J. S. Friedley assistant superintendent.

West Virginia University.—C. P. Hartley, assistant bacteriologist, has resigned to accept a position with the department of botany of the University of Minnesota.

Wyoming Station.—In cooperation with the Bureau of Animal Industry of this Department, a somewhat extensive experiment in sheep breeding is in progress with a flock of 247 high grade and pure bred Rambouillet breeding ewes, and 6 pure bred Rambouillet rams. The experiment is to be conducted so far as possible under actual range conditions, the sheep being kept on the range during the entire year.

Office of Experiment Stations.—R. D. Milner, previously connected with the nutrition investigations of the Office, has been assigned to the departments of agricultural chemistry, dairying, dairy farming, and agrotechny in *Experiment Station Record* formerly covered by Dr. H. W. Lawson.

Poultry Investigations of the Bureau of Animal Industry.—The Bureau has completed the equipment of the poultry plant at its experimental station at Bethesda, Md., and the investigations are under way. The plant has a capacity of 325 laying hens, with sufficient range for the rearing of young stock. Records are being kept of the egg production by means of trap nests. The work also includes a comparison of dry and moist mash and the hopper methods of feeding, a comparison of the growth of capons and cockerels, and as to the possibility of replacing linseed meal in the ration by a small amount of cotton-seed meal.

M. M. Hastings, a graduate of the Kansas College, has been appointed an assistant in the poultry investigations and will make a study of problems relating to methods of production, transportation, and marketing of eggs and poultry.

Graduate School of Agriculture.—A preliminary announcement has been issued for the Graduate School of Agriculture to be held July 6–31, at Cornell University and the New York State Station. Courses will be offered in biochemistry, agronomy, horticulture, dairy husbandry and dairying, poultry farming, veterinary medicine, and entomology, with numerous conferences on various phases of agricultural work, and excursions to typical horticultural and dairy farms.

Agriculture and the National Education Association.—It is announced that at the meeting of the department of superintendence of the National Education Association in Washington, D. C., February 25–27, considerable attention is to be given to agricultural education. A round-table conference will be held at which the topics will include cooperation between the State agricultural college and the State normal school in training teachers for elementary agriculture, and cooperation by the United States Department of Agriculture and State school authorities in promoting agriculture in the public schools.

It is also planned to organize at this meeting a department of rural and agricultural education in the association coordinate with the existing departments. This action was authorized by the board of directors of the association at the July meeting in Los Angeles.

International Live Stock Exposition.—The eighth exposition of the International Live Stock Association, held in Chicago November 30 to December 7, continued the successes of previous years. In spite of the financial stringency and extremely disagreeable weather during the opening days the attendance was remarkably good, especially from the city and near-by points. This may be attributed in part to the attitude of the daily press of Chicago, which accorded the exposition much more adequate recognition than formerly. One prominent journal issued a special eight-page edition devoted to the exposition and its objects, magnitude, and special interest to city people.

The number of exhibits exceeded by 28 per cent the record of the year before, including 1,263 cattle, 665 horses, 375 hogs, and 1,146 sheep, or a total of 3,499 animals, and in most of the classes there was continued improvement in the quality of the entries as well. Seventeen States were represented, and the international scope of the exposition was once more demonstrated by entries from Canada, England, Scotland, and Germany, and the presence of visitors from these and many other foreign countries.

The influence of the agricultural colleges and experiment stations was again strongly in evidence. The list of judges included 13 members of their staffs, the students were, as in former years, a prominent and distinctive feature, and the exhibits of 11 institutions were distributed through nearly every class of entry.

In the fat stock division their predominance was especially marked. In the award of prizes in the open competitions, Ohio University again furnished both the champion Berkshire barrow and the grade champion pen of 3 of all breeds, besides many class prizes. The Iowa College had the champion pen of Poland Chinas, and won several prizes with other breeds, as did also Wisconsin, which received second on dressed carcasses from 100 to 200 lbs. in weight. A new feature was the exhibition by Cornell of a pen of Cheshires.

The exhibit of sheep from the Wisconsin University attracted much attention, especially several pens of lambs entered by the station in a comparison of different breeds and rations. At the close of the test the lambs were slaughtered and the carcasses graded. First place in the breed test was awarded to the Southdowns, closely followed by the grade Shropshires. In the feeding test, cracked peas, cracked barley, and cracked corn were compared as supplements to whole oats and bran, and with a ration of whole oats and cracked barley 1:1, the highest rating being given to the pen receiving cracked peas. Wisconsin was awarded first in a special competition for American bred Shropshires, with South Dakota second, and several other prizes went to these institutions and to the Missouri University. In the slaughter tests Wisconsin won first and second for one to two-year-old wethers with Iowa third, and was first for lambs with Iowa third.

For cattle, Ohio University won first for calves and the breed championship on Shorthorns, and other prizes went to Kansas, Nebraska, and Iowa. Minnesota won first for two-year-olds with the Aberdeen-Angus, third for yearlings, second and fourth for calves, and the breed championships both for single steers and herds. The Kansas College won a first for calves, a fourth for two-year-olds, and seconds for yearlings and herds; Nebraska a first for yearlings and thirds for two-year-olds and herds; Missouri a third, and Purdue a fifth for calves, and Iowa a fifth for herd.

For Herefords, the Minnesota, Nebraska, Purdue, and Missouri universities were among the prize winners. Iowa won third on yearlings with Peerless Wilton 39th's Defender, last year awarded as a calf the grand championship of the show. The Galloway winners were exclusively from the colleges and stations, Missouri receiving first on two-year-olds and calves, and the championships on single steers and herds, and Ohio first on yearlings, the remaining prizes going to these institutions, Iowa and Nebraska. Ohio also won first in the two-year-old class and the championship for single steers with the Red Polls.

In the grades and crossbreds the first place for two-year-olds went to the Colorado College, and Purdue received first for junior yearlings. Purdue, Nebraska, Missouri, and Iowa also received other prizes in this class. The champion herd of the show from all breeds was, as last year, from the Minnesota Station. The grand championship of the show again went to a calf, this time a grade Shorthorn, Roan King, exhibited by James Leask of Ontario. The second choice was the Angus two-year-old Andy of the Minnesota Station, which received the same position last year.

In the slaughter tests of fat cattle the Iowa College won a first for two-year-olds and a second for yearlings. In the former class Ohio University was third and Kansas fourth, and in the latter Nebraska won a third and a fifth.

Two of the stations, Purdue and Missouri, participated in the exhibits of carload lots of cattle. Missouri sent a drove of grade Herefords typical of the stock procurable in that section, and Purdue a load of "short fed" Herefords fed by a Purdue senior, which received the first premium in its class. Complete data as to kind and cost of feeding and actual profits were available, and the demonstration was regarded as of great value.

With horses the Iowa College was particularly successful, receiving first for light draft horses in harness, third for aged stallions, first and fourth for aged mares, and fifth for two-year-olds in Clydesdales, and first and third for aged mares, second for three-year-olds, and fifth for two-year-olds in Shires. Ohio won fourth place in Clydesdale yearlings.

In the special classes for college and station stock the competition was keener than ever before. In the cattle classes Minnesota won first on two-year-olds, cattle one to two years old, and the championships for a single steer and a pen of 5. Colorado was second for two-year-olds, Kansas third, and Iowa fourth. For calves Ohio was first, followed by Missouri, Iowa, and Kansas, and for cattle one to two years old Kansas was second, Nebraska third, and Purdue fourth. Wisconsin won all the prizes for sheep except first on wether lambs and third on wethers one to two years old, which went to Iowa. Ohio won third for barrows, the remaining prizes for hogs going to Iowa. For the best general exhibit of 5 each of cattle, sheep, and hogs Iowa was first and Ohio second.

The large attendance of students elicited the remark from *Breeders' Gazette* that "the agricultural college has made the International one of its elective courses." Delegations were on hand from Illinois, Missouri, North Dakota, Cornell, Texas, Ohio, Iowa, Kansas, Wisconsin, South Dakota, Washington, and Ontario, and teams from 10 of these colleges were entered in the various judging contests. The corn-judging trophy, valued at $1,500, was permanently awarded to Iowa, it having won the trophy for 3 successive years. Iowa also secured permanent possession of the valuable horse-judging trophy, while that for work in judging cattle, sheep, and swine was awarded to Ontario. It is expected that new trophies will be offered for future competitions.

The Armour scholarships contingent upon these contests and the prize winnings of the colleges and stations have been awarded as follows: To Iowa 7, to Missouri 3, to Ohio, Minnesota, Nebraska, and Wisconsin 2 each, and to Purdue and Kansas 1 each. Of the Rosenbaum prizes for the greatest aggregate prize winnings of exhibitors from the respective States, the first prize of $500 was awarded to the Illinois University, the second of $300 to the Iowa College, and the third of $100 to Wisconsin.

Southern Commissioners of Agriculture.—The Southern States Association of Commissioners of Agriculture and Other Agricultural Workers held its annual meeting at Columbia, South Carolina, November 19–21. During the sessions Assistant Secretary of Agriculture W. M. Hays discussed agricultural education, reviewing the rise of the agricultural colleges and advocating the centralization of the rural schools, the establishment of agricultural high schools, and the closer organization of farmers for mutual benefits.

Other addresses were delivered by B. H. Rawl, of the Dairy Division of this Department, on Cooperative Demonstration Work in Dairying in the Southern States; by Dr. C. A. Cary, of the Alabama Station, on The Relation of Farmers' Institutes to Demonstration Work; by T. B. Parker, of the North Carolina State Station, on Field Demonstration Work by State Departmens of Agriculture; by W. R. Dodson, of the Louisiana Station, on the Cooperation and Coordination of the Work of State Departments of Agriculture and State Experiment Stations; by C. L. Willoughby, of the Georgia Station, on Cooperation Between the Experiment Stations in the Cotton Producing States, and by A. M. Soule, of the Georgia College, on Cooperative Demonstration and Institute Work.

Considerable discussion followed these papers as to the respective functions of the State departments of agriculture and the colleges and stations in extension work, and a standing committee was appointed to report on the subject at a subsequent meeting. Commissioner J. A. Wilkinson of Alabama discussed new work for departments of agriculture, advocating official soil surveys, work in seed selection, and forest preservation, some of these phases being presented in further detail by J. L. Bryan and C. L. Hill. The Relation of the Manufacturer to the User of Fertilizers was discussed by F. B. Dancy. New Nitrogenous Fertilizers by F. B. Carpenter, and the Phosphates of Florida by E. H. Sellards, formerly of the Florida Station.

At the election of officers, Commissioner Thomas G. Hudson, of Atlanta, Ga., was chosen president, and Director B. W. Kilgore of the North Carolina State Station, secretary. The convention of 1908 will be held at Nashville, Tenn.

National Drainage Association.—The first annual congress of this association was held in Baltimore, Md., November 25–27. The programme included an illustrated lecture on Salt Marsh Drainage in New Jersey, Direct and Indirect, by J. B. Smith, of the New Jersey Station; papers on The Status and Present Need of Agricultural Drainage, by C. G. Elliott, chief of the drainage investigations of this Office; The Control of Floods by Farm Management, by W. J. McGee, of the Bureau of Soils; and Forests in Their Relation to Drainage, by Gifford Pinchot, of the Forest Service. There were also papers and addresses on various aspects of drainage problems, especially as to the needs of a national drainage law, by Secretary of the Interior Garfield, Attorney-General Bonaparte, United States Senators Flint of California and Newlands of Nevada, Governor Broward of Florida, and others. Governor Broward was elected president of the association, and the next meeting will be held in Washington in May, at the time of the inland waterways convention.

Measures before Congress.—Among the bills recently introduced into Congress are the following: To provide from the receipts from forest reserves an annual appropriation of $2,500 to each college of agriculture and mechanic arts for instruction in forestry, and $2,500 to each experiment station for experiments in forestry; to provide an appropriation to each agricultural college for instruction in mining; to establish mining experiment stations; to establish engineering experiment stations at agricultural colleges with an annual appropriation of $30,000; providing an appropriation to the State normal schools for instruction in agriculture and manual training; to establish the University of the United States; to establish additional experiment stations in South Carolina and Mississippi; to establish an experimental wood distillation laboratory; to provide for a soil survey in Hawaii; to provide for grain inspection and standardization; directing the fixing of a standard of cotton classification; to provide for taking a census of agriculture; to grant the franking privilege to State and Territorial departments of agriculture; to amend the patent laws in the interest of originators of horticultural products; appropriaing $250,000 for the gipsy moth work,

$100,000 for the extermination of the green bug and other grain pests, and $100,000 for experiments in dry farming; and to provide for the printing of 100,000 copies of the special report on the diseases of cattle.

Miscellaneous.—An American Society of Agronomy was formed on the occasion of the meeting of the American Association for the Advancement of Science at Chicago during the holidays. The officers of the society are M. A. Carlton, president; C. P. Bull and B. M. Duggar, vice-presidents; T. L. Lyon, secretary, and E. G. Montgomery, treasurer. The object of the society is to encourage investigation in the field of agronomy, and to afford an opportunity for the discussion of methods and results.

The Association of Economic Entomologists at its meeting in Chicago decided to establish a Journal of Economic Entomology to be issued bimonthly, and to include the proceedings of its meetings, original papers, reviews, and notes. E. P. Felt, of New York, was elected editor, and E. D. Sanderson, of New Hampshire, business manager.

The Entomological Society of America has also decided to begin the issue of a series of memoirs.

A series of practical garden talks is announced by Secretary H. D. Hemenway of the Home Culture Clubs of Northampton, Mass., to be given at various times during the winter.

J. B. Farmer, professor of botany in the Royal College of Science in London, has accepted the editorship of *The Gardener's Chronicle* in succession to the late Dr. Maxwell T. Masters.

A further grant of about $1,000 a year has been made by the Drapers' Company to Cambridge University to be applied toward the salary of a professor of agricultural botany, and it is hoped to establish such a chair in the near future.

J. R. Sage has resigned the office of director of the Iowa Weather and Crop Service after nearly 18 years' service.

W. E. Collinge has resigned the professorship of economic zoology in Birmingham University to accept the directorship of the Cooper Research Laboratory at Berhamsted.

Dr. G. Delacroix, director of the station for plant pathology connected with the National Institute Agronomique, died in Paris on November 2, 1907.

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EXPERIMENT STATION RECORD.

VOL. XIX. FEBRUARY, 1908. No. 6.

The International Institute of Agriculture, at Rome, is a unique institution. It is in a class by itself. It is not for instruction, as some inquiries would imply, but strictly for investigation, the collection of data, and the prompt dissemination of information of interest to the nations of the earth. It is to deal especially with the economics of agricultural production and distribution, and with the sociological problems of agriculture. Its novel character makes the plans for its development a matter of no small interest.

Credit for the conception of an international institute of agriculture belongs to an American, Mr. David Lubin, of California, who sought the assistance of the King of Italy in carrying the idea into effect. The plan appealed to the King, who issued a call, through the Italian ambassadors, to the different nations of the world for a conference at Rome to consider the advisability of establishing such an international institute. The conference took place in May, 1905, one hundred and fourteen delegates representing forty countries being present. After deliberating something over a week on the matter, the "acte final" was adopted and signed by the delegates present, providing for the establishment of the institute and outlining its constitution and functions. The convention was afterwards ratified by plenipotentiaries of the respective countries. Twenty-five nations, including nearly all of agricultural importance, have joined in the undertaking and pledged their support.

This country has made an appropriation of $4,800 for the payment of its quota toward the support of the institute for the fiscal year 1907, and $8,600 for the salary of a member of the permanent committee and for the expenses of delegates to the general assembly of the institute. The Italian Government is erecting a palace in the gardens of the Villa Borghese in Rome, to serve as headquarters of the institute. This is a handsome two-story building, containing an assembly hall, and executive and clerical offices. Announcement has been made that the first meeting of the permanent committee in charge of the institute will be held this spring, and the institute will be inaugurated and enter upon active work as soon thereafter as possible.

In the meantime the Italian Royal Commission has instigated an inquiry into the exact character and extent of the information which the different countries are in position to supply with regard to their agricultural production. This information will be catalogued and classified, and a report upon it will be ready for the use of the permanent committee when it meets. The systems in operation in various countries for the collection of agricultural statistics are also being studied, in order that the value of these statistics may be judged of and means of improvement suggested where desirable.

The functions of the institute are strictly economic and sociological. While its duties have not been worked out in detail, the "acte final" prescribes as among the principal duties that the institute shall collect, study, and publish as promptly as possible statistical, technical, and economic information of interest to agriculturists, excluding "all questions relating to the economic interests, the legislation, and administration of any particular nation." More specifically the data sought for publication relate to the cultivation of the soil, crop production, trade in and prices of agricultural products on the various markets, wages of rural labor, the appearance, spread and means of control of new diseases of plants. It will also give special attention to the subjects of agricultural cooperation, insurance, and credit. It is designed, therefore, to serve as a great intelligence bureau of the countries interested, for the dissemination of information relating to agricultural production throughout the world, and many economic and social phases of agriculture.

The finances of the institute are cooperatively provided. The calculated annual expense of the institute is about $175,000. Toward this sum the King of Italy has given the revenues of two domains near Pisa, which amount annually to $60,000. The balance of $115,000 is to be raised among the nations on the basis of units of subscription, which also determine the national representation and voice in the management of the institute. Five groups are recognized. Group 1 carries five votes and sixteen units of subscription, group 2 four votes and eight units, group 3 three votes and four units, group 4 two votes and two units, and group 5 one vote and one unit of subscription. For the first two years a unit of subscription is placed at $300 per annum, and the constitution provides that it can never be more than $500. The subscriptions therefore range from $300 to $4,800 per annum. Each nation elects the group it will join in the management and support of the enterprise. The United States has come in on the basis of group 1.

The control of the organization is placed in the hands of a general assembly of delegates, sent by the adhering nations and presided over by an elected president and two vice-presidents. The permanent committee, composed of members designated by the respective governments, is intrusted with the executive management of the institute, under the direction and control of the general assembly. Members of the committee may serve as the representative of one or more nations, but the actual number of members is to be not less than fifteen. The general secretary will act both for the committee and the assembly.

Thus there is brought into existence a real parliament of the nations, with a permanent cabinet and ministry devoted solely to a consideration of agricultural interests. It is a significant step in international cooperation, and the more so because it is directed toward the greatest of international industries and the one most far-reaching in its sociological influences. It signifies a uniting of forces in peaceful and productive occupations in mutual aid for mutual benefit. As such it is noteworthy as marking another step in the progress of civilization.

The question of suitable provision for publishing reports of the more scientific investigations carried on at the experiment stations, especially those under the Adams fund, is already attracting attention and will soon become an important one. It is generally recognized that these will not in their entirety or original form be suited to the regular series of bulletins. While the results of work of this character will ultimately prove of very great benefit to agriculture, its details will ordinarily have little interest for farmers or the general public. At the same time, in order to satisfy the proper demands of the scientific world and to give our agricultural investigators and students the information they should have regarding these researches, it will be highly desirable to have them published in as much detail and with as complete illustration as is usually done in the case of work of the same order in other branches of science.

Referring to this matter, the report of the Director of this Office, just issued, points out that this will mean the providing of a different class of publications from the ordinary station bulletins and reports. Either the individual stations must establish with the aid of State funds a technical series of publications, which, though limited in editions, will be relatively elaborate and expensive, or Congress must make provision for the grouping together of the scientific work of the stations in a general series of special publications to be issued under the authority of the National Government.

To the world at large the latter course would undoubtedly be the most satisfactory, since this would bring the research work of the stations together and establish a regular and permanent medium for its publication, thus making it readily accessible to scientists and students the world over. Foreign critics of our experiment station system have often expressed the view that under present conditions the national character of our system of agricultural research was obscured and the scientific value of much of the work of our stations was lost sight of because of the miscellaneous character of the station publications, and the multiplicity of the sources from which they emanated. There is little doubt that our stations would have a much better standing in the scientific world if their more scientific publications were differentiated from their popular ones and issued through a single regular channel.

The report suggests the possibility of establishing an editorial board through the Association of American Agricultural Colleges and Experiment Stations to represent the interests of the stations in this matter, and that this board might act in cooperation with this Office in the preparation for the press of reports submitted by the individual stations. There is ample time for the elaboration of this or some other satisfactory plan for securing the suitable publication of the scientific work of the stations, but it is felt that this problem should be carefully considered with a view to reaching a satisfactory solution in the near future.

The necessity for the exercise of patience in research, both by those who are prosecuting it and especially by the prospective beneficiaries, is emphasized in an address by Dr. D. P. Penhallow, published in a recent issue of *Science*. The address was delivered on the occasion of the opening of Clark Hall, the new botanical building at the Massachusetts Agricultural College.

Doctor Penhallow, for many years professor of botany in McGill University, is not actively engaged in agricultural research but he is quite familiar with the history of its development, and he makes an appeal which is especially opportune at this time. He points out that "nature's processes, although exceedingly certain of fulfillment, are nevertheless exceedingly slow. If it has taken five hundred million years to shape this earth and render it a fit habitation for man, man himself must not be impatient if he is required to spend a few years of arduous toil that he may unlock some of the doors which so carefully guard nature's secrets. Sixty-three years sped on their way from the time when Boussingault first endeavored to ascertain the source of nitrogen in plants, until a satisfactory explanation was reached through our knowledge of the action of root tubercles; and for more than sixty years Lawes and Gilbert sought the solution of plant nutrition without gaining the end in view.

"The laws of nature are not kept on draught, as it were, to be drawn in large or small quantity, according to the demand. To present a problem to an investigator and expect an immediate solution, or an immediate practical application, is to be prodigal of a costly equipment, to sacrifice unnecessarily the best and most carefully trained intellectual strength, and to bring discouragement and invite failure.

"It is no doubt true that when a commonwealth has invested a large amount of capital in specially trained men and expensive apparatus, it is reasonable to ask for results, and with this no fault can be found. The danger lies in the fact that sufficient opportunity is not allowed for the careful working out of a problem in all its scientific aspects. Under conditions of haste and undue pressure, the results, if worth anything, are very likely to be incomplete and unsatisfactory, and in too many cases they must be subject to costly revision.

"I feel disposed at this time to make an appeal to the citizens of this commonwealth to secure to the investigators who will occupy this building, as well as to all others in this college, freedom for the future from an incubus which, in the history of our experiment stations of the past, has for many years been prolific of disastrous results. I do this because this building should stand as an exponent of the best scientific work and thought, and because I know of no body of men, other than the citizens of Massachusetts, to whom such an appeal may be made with greater assurance of an intelligent hearing, and a fairer prospect that they will apply the remedy, *patience*."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Practical agricultural chemistry, F. D. S. ROBERTSON (*London, 1907, pp. X+210; rev. in Chem. News, 95 (1907), No. 2477, p. 237; Nature [London], 76 (1907), No. 1967, p. 246*).—This book attempts to give a complete laboratory course of practical chemistry for agricultural students, including quantitative analysis of solutions containing the commoner metals and acid radicals. Gravimetric analysis and simple volumetric determinations are treated, the more technical part of the book dealing with analyses of soils and phosphatic fertilizers, feeding stuffs, dairy products, oils and fats, sugars, tea, coffee, cocoa, alcoholic beverages, and water.

Agricultural chemistry. I, Nutrition of plants, K. GRAUER (*Agrikulturchemie I. Pflanzenernahrung. Leipsic, 1907, pp. 106; rev. in Österr. Chem. Ztg., 10 (1907), No. 18, p. 258*).—This little book gives in small compass a simple but quite complete review of the present status of knowledge relating to the chemical composition of plant substances, plant nutrition, chemical and physical properties of soils, and fertilizers.

Official and provisional methods of analysis, H. W. WILEY ET AL. (*U. S. Dept. Agr., Bur. Chem. Bul. 107, pp. XXIII+230, figs. 11*).—This bulletin is a revision of Bulletins Nos. 46 and 65 of the same Bureau, and includes all authorized changes and additions made prior to its publication. General and special methods have been rearranged and consolidated, and repetitions or contradictory material have been eliminated.

Volumetric determination of nitrogen in nitrates, J. G. C. VRIENS (*Ztschr. Analyt. Chem., 46 (1907), No. 6–7, pp. 414–420; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 538, II, p. 651*).—The method described is based upon the oxidation of ferrous ammonium sulphate when boiled with sulphuric acid and nitrates. The extent of oxidation is measured by means of a 0.1 per cent solution of potassium ferricyanid, a blue coloration indicating excess of iron salt, a brown color too little. "Separate portions of the nitrate solution are treated . . . with increasing (or decreasing) quantities of the iron solution until with one test a blue coloration is obtained on adding the indicator, whilst the next successive test, containing 0.1 cc. more of the iron solution, gives a brown coloration" when observed within 30 seconds after adding the indicator.

"The presence of considerable quantities of potassium sulphate, ammonium sulphate, and sodium oxalate has no influence on the results obtained by the method."

The coloring of nitrifying organisms, W. OMELIANSKI (*Centbl. Bakt. [etc.], 2. Abt., 19 (1907), No. 7–9, pp. 263, 264*).—A modification of Thesing's method is described.

Determination of phosphoric acid as phosphomolybdic acid, G. JÖRGENSEN (*Ztschr. Analyt. Chem., 46 (1907), No. 6–7, pp. 370–392, pl. 1; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 538, II, p. 652*).—The author concludes from extended studies of this method that to obtain accurate results by its use the excess of molybdic acid solution should not be large, the precipitate should be allowed to settle for 24 hours at ordinary temperature before being collected on a filter, and the precipitate and filter should be ignited at a moderate heat over an Argand burner with constant stirring until the filter paper is completely burned. The compound thus obtained has the formula $P_2O_5.24MoO_3$.

An important question in the fertilizer industry, E. H. Schultze (*Chem. Ztg., 31 (1907), No. 65, p. 801*).—Attention is called to the importance of accurate determination of the water-soluble phosphoric acid in superphosphates, and it is asserted that no method for the determination of free phosphoric acid has yet been proposed which gives reliable results.

Determination of calcium oxid, magnesium oxid, and phosphoric acid by means of the Zeiss refractometer, B. Wagner and F. Schultze (*Ztschr. Analyt. Chem., 46 (1907), No. 8, pp. 501–508, figs. 3; abs. in Chem. Zentbl., 1907, II, No. 10, pp. 844, 845*).—The calcium is precipitated as oxalate, converted first to oxid and then to acetate, and in this form examined in the refractometer. The magnesium and phosphoric acid are precipitated as ammonium-magnesium phosphate and a sulphuric acid solution of the precipitate examined in the refractometer.

Dolomite and magnesite with reference to the separation of calcium and magnesium, N. Knight and W. H. Wheeler (*Proc. Iowa Acad. Sci., 13 (1906), pp. 167–171*).—Further experience with a method of precipitation of lime with ammonium oxalate in solutions of calcium and magnesium chlorid as described in Proceedings of the Iowa Academy of Science for 1903, p. 127, are reported, with critical comments on other proposed methods and studies of conditions affecting accuracy of the separation of calcium and magnesium.

The estimation of lime and magnesia in water by volumetric methods, W. T. Burgess (*Analyst, 32 (1907), No. 375, pp. 208–214, fig. 1; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 537, II, pp. 578, 579*).—The method for lime is based upon precipitation with ammonium oxalate and titration of the excess of oxalate with potassium permanganate. The magnesia is determined by precipitation with sodium hydroxid and determination of the alkalinity of the supernatant solution.

Chemical and bacteriological standards now in use in water analysis, J. H. Kastle (*Jour. Biol. Chem., 3 (1907), No. 3, pp. XXXV, XXXVI*).—The various chemical and bacteriological standards now in use in water analysis are reviewed and discussed.

Logarithmic factors for use in water analysis, W. S. Hendrixson (*Proc. Iowa Acad. Sci., 13 (1906), pp. 173, 174*).—A series of logarithmic factors for recalculating results of water analysis is given.

Investigations on the solubility of phosphoric acid and on the hygroscopicity of certain typical soils of Skaraborg County, G. Nannes (*Inaug. Diss., Univ. Königsberg, 1906, pp. 98*).—The investigations reported in full in this paper have already been more briefly reported in separate articles (E. S. R., 18, pp. 208, 318).

Available plant food in soil, W. A. Hargreaves (*Jour. Dept. Agr. So. Aust., 10 (1907), No. 7, pp. 420–425; Dept. Agr. and Intel. So. Aust. Bul. 20, pp. 7*).—This article reviews investigations relating to chemical methods of determining available plant food in soils and states the history of such work to be a "record of comparative failure."

Analysis of egg yolk, N. A. Barbieri (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 2, pp. 133–135*).—The author identified in egg yolk tristearin, triolein, cholesterin, crystallized sulphur, and a substance rich in phosphorus and similar to the body which has been called cerebrin for which the name "ovin" is proposed.

Milk coagulating agents in the juice of the Chinese mulberry, C. Gerber (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 12, pp. 530–532*).—The author found from experiments that there exists in the juice of the Chinese mulberry (*Broussonetia papyrifera*) an activating substance without which the coagulating diastase is incapable of causing curdling of milk. The action of these two substances resembles that of alexin and its sensitizing agent in hemolytic serums and bactericides, or that of trypsin and kinase in the intestinal juice.

The structure of the starch grain, II, H. Kraemer (*Amer. Jour. Pharm., 79* (*1907*), *No. 9, pp. 412–418*).—By the treatment of definite amounts of starch with definite quantities of iodin solution it may be shown that the amount of soluble starch varies in starch grains of different origin.

In summing up the observations on the behavior of iodin and starch, the author states: "That we are dealing with a chemical compound of iodin and soluble starch; but that the combination is a feeble one, being easily dissociated upon the application of heat, and the iodin being more or less volatilized. Also the facility with which soluble starch takes up the iodin in a chloroformic solution indicates that the affinity of starch for iodin is considerably greater than heretofore supposed."

A method of staining starch is described in which an aqueous solution of iodin and gentian violet is used. The method is especially adapted to wheat starch and corn starch, but in the case of potato and maranta starches weaker iodin solutions are necessary and for these two starches the method is not entirely satisfactory. Earlier work has been noted (E. S. R., 19, p. 259).

On some applications of safranin as a test for carbohydrates, H. MacLean (*Bio-Chem. Jour., 2* (*1907*), *No. 9, pp. 431–442*).—The experimental data reported are favorable to the use of safranin.

"Safranin is a general test for carbohydrate bodies of a certain type, and is one of the most suitable reagents for determining the presence of traces of carbohydrates in liquids; it is unaffected by all the ordinary 'interfering' substances of urine except those of a carbohydrate nature.

"Safranin is not decolorized by albumin after long boiling, but the presence of albumin in the liquid to be tested interferes with the delicacy of the reaction; ammonia in excess acts in a somewhat similar manner.

"In digestion experiments the amount of starch changed can be comparatively easily obtained, while the differences in the carbohydrate contents of urine or blood, after standing for some time, as the result of glycolytic action, can be easily and fairly accurately determined. . . .

"The [reported data] indicate the uses of safranin for solutions containing small amounts of carbohydrate, and while the reagent possesses certain disadvantages with regard to its use as a routine test for the examination of urine in unskilled hands, it often proves exceedingly useful for the detection of traces, especially when combined with yeast fermentation."

Colorimetric determination of the albumin contents of barley, with Millon's reagent, C. J. Lintner (*Brewers' Jour., 31* (*1907*), *No. 12, p. 553*).—A modification of Millon's reagent is described, which, according to the author, gives satisfactory results in determining the albumin content of barley.

Determination of the starch contents of barley by polarization, C. J. Lintner (*Brewers' Jour., 31* (*1907*), *No. 12, pp. 555, 556*).—The report of data show that the starch content decreases as the protein content increases and this relation, according to the author, seems to be more clearly expressed "by the figures obtained with the polarization method than by those obtained from the methods of steaming."

Saccharid and nonsaccharid constituents of sugar beets, their properties, chief compounds, and the most important products of transformation and decomposition, G. S. Likhovitzer (*Separate from Vyestnik Sakh. Promuish., 1904–5, pp. 246; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.] 8 (1907), No. 1, pp. 88, 89*).

Analyses of cane and beet sugar in sugarhouses and refineries, C. Fribourg (*L'Analyse Chimique en Sucreries et Raffineries de Cannes et Betteraves. Paris, 1907, pp. XII+390, figs. 51*).—A handbook of sugar chemistry and laboratory methods designed especially for the use of sugarhouse chemists.

Polarimetric estimation of sugars in honey, J. Fiehe (*Ztschr. Untersuch. Nahr. u Genussmtl., 14 (1907), No. 4, pp. 299–304*).—A polemical discussion of methods with special reference to pure and adulterated honey.

The detection of bleached flours, F. J. Alway and R. A. Gortner (*Jour. Amer. Chem. Soc., 29 (1907), No. 10, pp. 1503–1513*).—According to the authors' investigations, "a bleached flour may with certainty be distinguished from an unbleached flour, and the kind of bleaching agent employed may be identified as nitrogen peroxid or halogen. The amount of bleaching agent that has been applied to a flour may be estimated from the amount of certain reaction products remaining in the flour.

"With the Griess-Ilosvay reagent all flours bleached by means of nitrogen peroxid give a pink coloration, while unbleached flours give no coloration. Only when extreme precautions are observed is the test reliable.

"Bleached flours lying alongside of unbleached flours do not give off any substance which will so affect the latter that they will give the test for bleached flours. Neither nitrogen peroxid nor nitrous acid is present in bleached flours, the characteristic reaction being produced by nitrites.

"The amount of nitrites in bleached flours is very small, the average being 6.3 parts per million for all the samples examined. There is little difference in the amount of nitrites produced by the two kinds of bleachers.

"The amount of nitrite in a bleached flour is approximately proportional to the amount of nitrogen peroxid that has been used. The average amount of the bleaching agent used by 25 Nebraska mills would accordingly be approximately 5 cc. per kilogram of flour."

The analysis of ice cream, C. D. Howard (*Jour. Amer. Chem. Soc., 29 (1907), No. 11, pp. 1622–1626*).—The author gives notes regarding the methods in use in the New Hampshire laboratory of hygiene in the determination of fat, character of the fatty matter, chemical preservatives, fillers, and "mechanical preservatives" in the analysis of ice cream.

The estimation of boric acid and borates in food stuffs and commercial products, R. J. Manning and W. R. Lang (*Jour. Soc. Chem. Indus., 26 (1907), No. 14, pp. 803, 804*).—The methods described for determining boric acid in milk and borates in methyl alcohol and salt depend upon distillation and precipitation as barium borate and upon distillation and titration. An additional titration method for the detection of boric acid in milk is given which has not yet been completely worked out.

Salting out cocoa fat soaps as a means of identifying cocoa fat, R. Cohn (*Chem. Ztg., 31 (1907), No. 70, pp. 855–857*).—The author's results were favorable to the use of this method for the detection of cocoa fat. In his opinion, the salting out method gives satisfactory results for detecting the presence of capronic, caprylic, and caprinic acid in other bodies than fats.

The influence of oxygen and of nitrogen, and sunlight and darkness on olive oil as affecting the iodin and saponification numbers and the production of rancidity, L. A. Ryan and J. Marshall (*Amer. Jour. Pharm., 79 (1907),* *No. 7, pp. 308–315*).—From the experiments reported the authors conclude that the effect of oxygen on olive oil is to decrease the iodin number and increase the saponification number. It also has a marked tendency to induce rancidity and diminishes the color originally possessed by the oil. Unsterilized oil exposed to diffused sunlight showed a higher iodin number and a lower saponification number than sterilized oil similarly treated. Sterilized oil kept in the dark had a slightly higher iodin number and a slightly lower saponification number than similar oil exposed to diffused sunlight.

Nitrogen, under the experimental conditions, did not affect the iodin number of sterilized or unsterilized oil, though it increased the saponification number of sterilized oil.

The determination of arsenic and other solid constituents of smelter smoke, with a study of the effects of high stacks and large condensing flues, W. D. HARKINS and R. E. SWAIN (*Jour. Amer. Chem. Soc., 29 (1907), No. 7, pp. 970–998, figs. 7; abs. in Chem. Zentbl., 1907, II, No. 11, pp. 936, 937*).

Chemical novelties for 1907, C. POULENC (*Les Nouveautés Chimiques pour 1907. Paris, 1907, pp. XI+347, pl. 1, figs. 196*).—This publication contains condensed accounts, with illustrations, of new laboratory apparatus and new methods of research applied to science and industry, among which are some of interest in agricultural investigations. For example, on pages 279–311 is given the description of apparatus employed by Bordas and Touplan in the application of their method for a rapid and complete analysis of milk.

METEOROLOGY—WATER.

Report of the meteorological committee, Great Britain (*Rpt. Met. Com. [Gt. Brit.], 1907, pp. 150, pls. 7, fig. 1*).—This consists as usual of administrative reports regarding organization and operations (during the year ended March 31, 1907) in marine meteorology, forecasts and storm warnings, climatology, publication, and miscellaneous subjects, with appendixes relating to telegraphic reports from Iceland, supply of information to the public, lists of captains who sent in "excellent" meteorological logs during the year and of logs and documents received from ships, distribution of instruments, report on inspection of meteorological stations, list of persons and institutions from whom publications and meteorological data have been received and to whom publications are sent, and financial statement.

Among the papers on special investigations reported as completed during the year are: Temperatures as Indicated by Spirit Minimum and Mercury Minimum Thermometers, by C. Chree; The Observations of Atmospheric Electricity, by C. T. R. Wilson; Temperatures in the Screen and in the Open Air, and Aspiration Psychrometer Readings, etc., by W. H. Dines; Wind Measurements, by R. H. Curtis; An Apparent Periodicity in the Yield of Wheat in Eastern England, 1885–1905, by W. N. Shaw (E. S. R., 18, p. 713); and The Line Squall of February 8, 1906, by R. G. K. Lempfert.

An important development in forecast methods during the year was "the introduction of the consideration of frequency of occurrence into the representation of the weekly results [as] necessitated by the decision to give in the Weekly Weather Report a brief verbal representation of the character of the weather in successive weeks that might be useful for agricultural purposes."

It was found that the simple average or arithmetic mean would not serve this purpose. The weekly reports for the years 1881 to 1905 were therefore examined with reference to frequency of occurrence of accumulated temperature above and below 42°, rainfall, and sunshine, grouping the data so that "of the total number of weekly values for each element included in the period mentioned above, one-third are characterized as moderate, one-third fall on the side of excess, and one-third on the side of defect. A further subdivision is effected by prefixing the adverb 'very' to the description in the case of one-twelfth of the values reckoned from either extreme. . . .

"The first step in the process of fixing the limits consisted in the determination of the average value for each week for each element and for each district. The average values, found by taking the mean in the usual manner, were then smoothed by Bloxam's formula $\frac{A+2B+C}{4}$, and the results adopted as averages 'for the time of the year.' Subsequently the frequency distributions of the divergencies from these smoothed averages were determined for each element. From these, working diagrams were prepared for each district. . . .

"The classification has been undertaken with the object of summarizing in a convenient form the meteorological characteristics of a long period, such as a season or a year, by enumerating the number of weeks of each kind experienced within it, and tables are given in each issue of the report summarizing the weather of the current season and of the past four seasons on these lines. By this means it is hoped that the comparison of meteorological results with other statistics will be facilitated."

The afternoon harvest forecasts were continued as in previous years, 87 per cent of them being completely or partially successful. Of the regular forecasts for the whole of the British Isles 85.5 per cent were successful.

Meteorological report, F. SMITH (*Wyoming Sta. Rpt. 1907, pp. 141–143*).—Summaries are given of observations at Laramie, Wyo., on pressure, temperature, precipitation, humidity, sunshine and cloudiness, and wind movement during 1906. The mean annual temperature was 44.6° F., and the total precipitation 12.57 in., which is about 2.5 in. larger than the average for the last 16 years.

Meteorology, J. H. HART (*Trinidad Bot. Dept., Bul. Misc. Inform., 1907, No. 56, pp. 318–320; Ann. Rpt. Supt. Roy. Bot. Gardens [Trinidad], 1906–7, pp. 19–25*).—Summaries are given of observations at St. Clair, Trinidad, of pressure, temperature, and rainfall from 1888 to 1906, inclusive, with somewhat more detailed data for each month of 1906. The mean annual temperature recorded for 19 years is 78.5° F., the annual rainfall 66.4 in., and the mean annual relative humidity 79. The conditions during 1906 agreed closely with these normals.

[**Meteorological records, Fiji Islands, 1875–1906**] (*Leg. Council Fiji Paper No. 13, pp. 13–16*).—Monthly and annual means of temperature, pressure, rainfall, and humidity are given for the period 1884 to 1906 at Suva, and for the period 1875 to 1885 at Levuka; also detailed observations for the year 1906 at Suva, and mean monthly rainfall for the same year at a number of different points in the islands.

On the meteorology of the Nile Valley, H. G. LYONS (*Met. Ztschr. [Brunswick] 24 (1907), No. 5, pp. 205–212*).—This article is based on a report by the author which has already been noted (E. S. R., 18, p. 424).

The cold spring of 1907, A. J. HENRY (*Mo. Weather Rev., 35 (1907), No. 5, pp. 223–225*).—The weather map features accompanying the cold spring of 1907 are reviewed and other cold seasons of previous years are described. The conclusion is reached that "the underlying causes of the recent cold weather are probably obscure and deep seated, [but] that the chance of injury to the staple crops of this country by reason of a backward spring is rather remote, provided, of course, a sufficient amount of heat is supplied in June. . . . Drought and heat are much more likely to make serious inroads on the crops than are the chilling blasts of April and May."

Cyclonic distribution of precipitation, J. A. UDDEN (*Proc. Iowa Acad. Sci., 13 (1906), pp. 223-225, pl. 1*).—From the results obtained by a method described in an earlier report (E. S. R., 17, p. 531) the following conclusions are drawn:

"(1) That the area of greatest precipitation is not the same for different stations. They suggest that the cyclonic distribution of precipitation bears a definite relation to climate, and varies with this.

"(2) That if the area of greatest precipitation is to the southeast of the center of cyclones in the Upper Mississippi Valley (as taken for granted hitherto in general works on American meteorology) there must be a very marked diurnal shifting of this area concerning which nothing is as yet known; for to make up for the deficiency of precipitation in this part of the composite cyclone of the morning hour there would have to be a corresponding excess during some other part of the day.

"(3) That in either case the variations in the location of this area of greatest precipitation, be they local or diurnal, are quite probably of sufficient magnitude to appreciably affect the accuracy of weather forecasts."

The influence of precipitation on the yield and quality of crops, W. SCHNEIDEWIND ET AL. (*Landw. Jahrb., 36 (1907), No. 4, pp. 574-581, pl. 1*).—Observations during the period 1896 to 1906 on the influence of precipitation on (1) the yield of crops in general, (2) the yield of individual crops, and (3) the quality of the crops, are summarized and discussed.

The observations show that in dry years with lower yields the seed crops were richer in protein and the root crops richer in carbohydrates and protein than in wet years and thus that the net outcome is not so small as the gross results would indicate. High-bred resistant sugar beets showed less variation in dry and wet years than common varieties. The high-protein barley grown in dry years is less valuable for brewing than lower protein barley.

Forests and rainfall in West Prussia and Posen and the influence of wind on rain and snow measurements, J. SCHUBERT (*Ztschr. Forst u. Jagdw., 38 (1906), No. 11, pp. 728-735, figs. 4; abs. in Science, n. ser., 26 (1907), No. 668, p. 518*).—A critical study.

Man's influence on climate, T. R. SIM (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 7, pp. 717-724*).—This article discusses local influence on climate due to building of structures of various kinds, drainage, and the smoke and fumes of manufacturing establishments, but more particularly the wider influence exerted by the maintenance or destruction of vegetation on the surface of the earth.

Protection of buildings from lightning, A. R. SAWYER and L. J. SMITH (*Michigan Sta. Bul. 249, pp. 17-35, figs. 5*).—This bulletin gives rules for the erection of lightning conductors, as issued by the Lightning Rod Conference in 1882, with observations thereon by the Lightning Research Committee, 1905, and describes the system of lightning protection used on the college barns, with details of its construction.

River discharge, J. C. HOYT and N. C. GROVER (*New York and London, 1907, pp. VIII+136, pls. 7, figs. 24*).—This book attempts to bring together from all available sources information in regard to the best practice, in suitable form for the use of students and engineers. "Much new matter is also presented, especially the descriptions of the conditions necessary for good gaging stations at which measurements of discharge may be made either by weir, current meters, floats, or slope; the routine of the selection, establishment, and maintenance of gaging stations; the details of the field work of discharge measurements, and the office methods of computing the regimen of flow." The work is based mainly on the hydrologic investigations of the U. S. Geological Survey.

On the regime of the streams of the dry region of Northern Brazil, O. A. Derby (*Bol. Dir. Agr. Bahia, 9* (*1907*), *No. 4, pp. 334–345*).—Measurements of stream flow for a series of years are recorded.

The drought antidote for the northwest, or the utilization of the artesian resources of New South Wales, P. Allan ([*Sydney, 1906*], *pp. 95, pls. 8, figs. 36, dgms. 3, maps 4*).—This publication discusses in some detail the conditions necessary for the occurrence of artesian water, and the location, extent, and character of the artesian basin in Australia, and more particularly in New South Wales, and gives data regarding the wells bored under the provisions of various legislative enactments. The machinery and methods used in drilling artesian wells and the methods of utilizing the water are described.

Of the 412 artesian wells recorded the 130 bored by the government are capable of irrigating with present works over 2,000,000 acres of land. "When it is remembered that, in addition to the 2,027,534 acres referred to, there are 280 private bores watering large tracts of country, besides public watering-place bores, the immense value of the artesian supply can be readily grasped, more especially as without an efficiently distributed water supply, a great portion of this arid, or semiarid, portion of the State could not be profitably occupied."

The water of the Oder Valley, Luedecke (*Das Wasser des Odertales und die Wasserkalamität der Stadt Breslau. Leipsic, 1907, pp. 36, figs. 4*).—Chemical studies of the quality of the water of the Oder River at different periods and stages and of the ground water and springs of the valley are reported, as well as an examination of the sources of contamination and means of removal.

Clean water and how to get it, A. Hazen (*New York and London, 1907, pp. VI+178 pls. 14*).—"This little volume deals with the means now used by American cities to secure clean water, and with the application of these means to new problems. Some closely allied subjects are also touched upon, including some matters of general policy, pressure, and fire service, the sale of water, and the financial management of waterworks."

Different chapters treat of impounding reservoir supplies, water supplies from small lakes, the Great Lakes, and rivers, ground-water supplies, the action of water on iron pipes and the effect thereof on the quality of the water, development of water purification in America, and the nature of the methods of purifying water.

The disinfection of sewage effluents for the protection of public water supplies, K. F. Kellerman, R. W. Pratt, and A. E. Kimberly (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 115, pp. 47*).—This bulletin reports experiments made in cooperation with the Ohio State Board of Health with the copper sulphate treatment of sewage effluents at St. Mary's of the Springs, Westerville, the Boys' Industrial School, Lancaster, and Marion, Ohio, and with the chlorin treatment at the Boys' Industrial School, and at Marion.

The importance of the destruction of pathogenic bacteria in sewage effluents, especially when the sewage is discharged in the vicinity of shellfish beds or when town and city water supplies are menaced with contamination, is discussed.

The results reported show that—

"Both calcium hypochlorite and copper sulphate have high germicidal values when acting upon partially purified sewage. Calcium hypochlorite is much more rapid in its action, is more nearly able to bring about complete disinfection at a lower cost, and is less influenced by temperature and by the presence of carbonates. It is liable to deterioration upon standing and is more disagreeable and less convenient to handle than copper sulphate.

Studies on the soils from the northern portion of the Great Plains region. The distribution of carbonates on the second steppe, F. J. ALWAY and G. R. McDOLE (*Amer. Chem. Jour., 37 (1907), No. 3, pp. 275-283*).—Previous soil studies by the same authors have already been noted (E. S. R., 18, p. 615). The present contribution reports determinations of carbon dioxid and hygroscopic coefficients of 72 samples of soils from the region named.

The results show that all soils from the second steppe are well provided with carbonates, the subsoils containing more than the corresponding surface soils and subsoils of bowlder clay being much richer than those composed of clay of lacustral origin. The carbonates are found chiefly in the soil grains of intermediate size, namely, the silts. A high percentage of carbonates was with marked regularity associated with a low hygroscopic coefficient.

The so-called alkali spots of the younger drift sheets, O. W. WILLCOX (*Jour. Geol., 13 (1905), No. 3, pp. 259-263; abs. in Chem. Zentbl., 1907, I, No. 24, p. 1702*).—The occurrence of unproductive alkali spots in soils in various parts of Iowa, Wisconsin, Illinois, and Indiana is noted. The white efflorescence on these spots consists mainly of carbonate and sulphate of magnesium and calcium and a little sodium chlorid. The magnesium sulphate is considered to be the injurious constituent.

The salt content of polders flooded with sea water March 12, 1906, D. J. HISSINK (*Het Zoutgehalte van de op 12 Maart 1906 ondergeloopen Zeeuwsche Polders. The Hague, 1907, pp. 29*).—Studies of the amount and distribution of salts added to the soil by the sea water and their influence upon the original constituents of the soil, and the effect of drainage and application of lime, etc., in the reclamation of these salted lands, are reported.

Reference of soils to fruit requirements, C. E. BRADLEY (*Better Fruit, 2 (1907), No. 1, pp. 9, 10*).—The origin, general character, and average composition of the soils of Oregon, as shown by studies made by the experiment station, are briefly discussed, as well as the draft of different kinds of fruits on the fertilizing constituents of the soil.

It is shown that fruit trees are quite heavy feeders and that they use especially large amounts of potash. "An examination of some old orchard soils of our State, recently made by the experiment station, fails to show, however, any marked depletion of potash in the soil, a significant fact as regards its lasting qualities. It is true, however, that in general trees feed deep and consequently have a greater available supply than a shallow feeding crop."

Wire-basket method of testing soils, B. C. ASTON (*New Zeal. Dept. Agr., Chem. Div. Bul. 2, pp. 11, pls. 10*).—A description of this method reprinted from Circular 18 of the Bureau of Soils of this Department (E. S. R., 18, p. 12) is given, with an account of tests of the method on two New Zealand soils of widely differing character. Generalizations are reserved until the results have been checked by field experiments.

Pot experiments with fertilizers, B. C. ASTON (*Rpt. Bien. Conf. Agr. and Past. Assocs. New Zeal., 7 (1907), pp. 35-38*).—Field experiments with turnips are reported, the results confirming in general those obtained in experiments with the wire-basket method of the Bureau of Soils noted above.

Soil fertility (*Bol. Min. Fomento [Peru], 5 (1907), No. 8, pp. 32-79*).—A Spanish translation of Farmers' Bulletin 257 of this Department (E. S. R., 18, p. 119).

Changes in the chemical composition and productiveness of peat soils under fertilization, B. SJOLLEMA (*Chem. Weekbl., 4 (1907), pp. 365-369; abs. in Chem. Zentbl., 1907, II, No. 5, p. 424*).—Studies of moor soils near Groningen on which the oat crop sickened and in some cases died are reported.

The sick soils were found to be alkaline, while the healthy soils were decidedly acid. The sick soils absorbed more soda and contained more lime soluble in carbonated water than the healthy soils. The sick soils were made healthy by adding small amounts of manganese or ammonium sulphates. The humus of the sick soils was less soluble in ammonia than that of the healthy soils, and its autoxidation was promoted by the alkaline reaction of the soil. Autoxidation may have exerted an injurious effect by (1) causing a deficiency of oxygen in the soil atmosphere, (2) production of poisonous reduction products, or (3) formation of H_2O_2 and other peroxids. The beneficial effect of manganese sulphate is ascribed to its action in decomposing these peroxids.

The applicability to India of the Italian method of utilizing silt, E. C. Buck (*Jour. Soc. Arts, 55 (1907), No. 2845, pp. 734–743*).—The Italian methods of warping and distributing muddy irrigation water so that the silt will be deposited and enrich the soil are fully described and their applicability to conditions in India are discussed. Cases of successful reclamation of rough gullied land in India by means of dams, terraces, and drains, which check the flow of the irrigation water and allow the silt to be deposited, are cited.

The hygroscopic water of the soil and the underground dew, A. B. Speranski and T. N. Krasheninnikov (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8 (1907), No. 3, pp. 281–335*).—The authors report the results of experiments which showed that when the surfaces of soils containing 33 and 23 per cent of moisture were heated more than 30 per cent of the water lost by the upper layer of the soil passed as vapor into the lower layers and was there condensed. It was found that soils whose surfaces were periodically heated lost less water into the air than those not so heated. The greater the amplitude of the temperature variations the more favorable the conditions for the formation of underground dew.

The upper dried-out layer of soil apparently protected the lower layer from loss of moisture, and when heated a part of the water of the upper layer passed into the air and part into the lower layers of the soil. On cooling, the upper soil layer absorbed moisture both from the subsoil and from the air.

In the larger number of the experiments reported, the warming of the surface of a soil of low-water content increased the transpiration from plants but decreased evaporation from the surface of the soil. Thus, while the water was in large part driven to the subsoil by heating the surface of the soil, it was still available to plants, and the limited supply of soil moisture was better utilized than when the surface was not alternately heated and cooled.

The results of these experiments indicate an explanation of the deep rooting and the drought resistance of plants on arid soils.

Observations and calculations are given to show the amount of water which will thus pass between the different soil layers under varying temperature and moisture in order to maintain the equilibrium of vapor pressure throughout the soil.

Observations on temperature variations in soil, Grohmann (*Fühling's Landw. Ztg., 56 (1907), No. 8, pp. 273–281.*)—The heat capacity of various mineral constituents of soils is discussed and studies of the temperature conditions at different depths (0.1 to 0.5 meter) in various typical soils, as well as in air and water subjected to heat rays of 2 ton-calories for 1, 4, and 9 hours, are recorded.

It is shown that the heat relations of soils are dependent upon their properties and moisture conditions, and the conclusion is reached that the temperature variations may be calculated when the amount of sunshine is known.

A review of investigations in soil bacteriology, E. B. Voorhees and J. G. Lipman (*U. S. Dept. Agr., Office Expt. Stas. Bul. 194, pp. 108*).—This review attempts to summarize the more important results of investigations on this subject reported up to the end of 1906. The review has been prepared with the hope that it "may serve to call attention to the progress already made, to indicate the possibilities of the subject, and to stimulate further and broader inquiry in this important field in this country." The subject is discussed under the following heads: Methods, bacterial decomposition of nonnitrogenous organic substance, transformation of mineral constituents of soil, chemical phases of decay and putrefaction, ammonification, oxidation processes in the soil, nitrification, deoxidation processes in the soil, denitrification, bacterial synthesis of nitrogenous compounds, nitrogen fixation (nonsymbiotic and symbiotic fixation and soil inoculation), and unsolved problems.

Studies on the bacterial content of air and soils of the Antarctic region, E. Ekelöf (*Ztschr. Hyg. u. Infektionskrank., 56 (1907), No. 3, pp. 344–370, dgm. 1*).—Observations made during the Swedish South Polar Expedition of 1901–1904 are reported, showing a rather large and varied bacterial flora in the upper layers of the soil during the warmer months of the year but a very limited bacterial content in the air of the Antarctic regions.

Experiments on the formation of nitric acid in soils, E. Murmann (*Österr. Chem. Ztg., 10 (1907), No. 13, p. 181; abs. in Chem. Zentbl., 1907, II, No. 8, p. 624*).—Experiments on a small scale are reported in which soil from which lime had been extracted by treatment with hot hydrochloric acid was mixed with varying amounts of calcium carbonate (0.1 to 2 per cent) and the amount of nitrates formed in 15 days at 12 to 16° C. determined. The results show that the addition of 0.1 per cent of calcium carbonate very greatly increased the nitrate formation in the soil. The addition of as much as 2 per cent of calcium carbonate, however, resulted in a slight decrease in the rate of nitrate formation.

The fixation of nitrogen by the nodule former, R. Greig-Smith (*Jour. Soc. Chem. Indus., 26 (1907), No. 7, pp. 304–306; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 536, II, p. 498*).—Studies of various tubercle bacteria and nitrogen-fixing bacteria under different conditions are reported.

Nitrogen-fixing bacteria were found not only in the root tubercles but in the stems of plants. The organisms found in the tubercle produced a nitrogenous slime which was assimilated by the plant on which the tubercles occurred. Those living in the more acid stem, however, did not produce this nitrogenous slime. When transferred to artificial media the tubercle organisms exhibit differences in their slime-forming capacities. "Some do not produce it upon any kind of artificial medium, others do not do so immediately, but may be induced to form it by repeated and rapid transference upon suitable pabula. The majority form more or less slime upon all kinds of saccharin media, but a few, while producing it upon artificial media with a plant basis (e. g., saccharose bean-agar), refuse to do so upon an entirely synthetic medium." The author is of the opinion that the formation of root tubercles need not be considered a result of irritating parasitic action but rather as a consequence of the production of nutrients at that place resulting in better nourishment and growth of the cells than in other parts of the roots. It was found that dextrose, levulose, saccharose, maltose, and mannite furnished a good source of carbon for the organisms, but that lactose was a very poor nutrient. It is therefore believed that the use of whey as the basis for the preparation of a medium for cultures of such organisms would lead to disappointment, thus explaining the unsatisfactory results which have been obtained with commercial cultures prepared by the whey-gelatin method employed by European firms.

The organisms from the nodules of peas at different times were apparently identical but in case of blue lupines were very variable.

The best temperature for the production of slime appears to be 22° C., although an organism obtained from Robinia was exceptional in requiring a temperature of 26° C. for most efficient action. The organisms produce the most slime on media in which the nitrogenous and slime matter approximated that found in soil water, or that which would for example be represented by 0.06 per cent of asparagin and 0.1 to 0.2 per cent of alkaline phosphate. Mixed cultures of slime-producing organisms are suggested for general use.

On the biology of nitrogen-fixing micro-organisms, SEVERIN and HELENE KRZEMIENIEWSKI (*Anz. Akad. Wiss. Krakau, 1906, pp. 560–577; abs. in Chem. Zentbl., 1907, I, No. 24, pp. 1701, 1702*).—A study of the bacterial flora and activities in soil which has been used in fertilizer experiments for 11 years is reported.

Azotobacter was much more numerous in limed soil than in unlimed and the fixation of free nitrogen was much more active in cultures inoculated with the limed soil, regardless of whether the inoculating soil had been fertilized with nitrogen or not. The cultures inoculated with limed soil showed a nitrogen fixation in 10 days of 16.75 and 18.39 mg., and those inoculated with unlimed soil of 6.83 and 7.47 mg. The nitrogen content was in general always greater in the limed soil than in the unlimed.

In pure cultures of *Azotobacter chroococcum* the fixation of nitrogen by this organism was quite small and there was no production of hydrogen or other combustible gases. The amount of oxygen consumed in crude as well as pure cultures agreed almost exactly with the carbon dioxid produced.

The organisms which produce the root tubercles of leguminous plants, G. DE ROSSI (*Centbl. Bakt.* [*etc.*], *2. Abt., 18 (1907), Nos. 10–12, pp. 289–314; 16–18, pp. 481–489, pls. 2*).—Investigations relating to the fixation of atmospheric nitrogen by leguminous plants are reviewed and a bibliography of 165 references is given; the general nature of the micro-organisms heretofore obtained from leguminous root tubercles, more especially *Pseudomonas radicicola*, and the artificial production of root tubercles are described; the need of further investigation is explained; the author's experimental technique is described; and studies of the tubercle contents and capacity of the tubercle organisms of *Vicia faba* are reported.

The author questions whether previous investigations have isolated a specific organism producing root tubercles and shows that organisms which produce tubercles and those which do not produce tubercles may be derived from tubercles of leguminous plants. He describes and explains the method of isolation and identification of a specific organism derived from root tubercles of *V. faba* which produces root tubercles and which he claims is morphologically, biologically, and culturally widely different from *Bacillus radicicola*, Beijerinck.

The author explains how the characteristic Y-form bacteroids of *V. faba* undergo a kind of vacuolation in the process of their development, and shows that this change has an important bearing on the activities of the organism under different cultural conditions.

The root bacteria of the Leguminosæ, A. RODELLA (*Centbl. Bakt.* [*etc.*], *2. Abt., 18 (1907), No. 13–15, pp. 455–461; Jour. Inst. Brewing, 13 (1907), No. 4, pp. 320–327; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 11, p. 627*).—After discussing the various views which have been held by investigators as to the nature of the bacteroids of root tubercles of Leguminosæ, the author reports investigations from which he concludes that these ramified bodies, improperly termed bacteroids, "are exclusively due to the acid generated in the tubercles of the Leguminosæ by the fermentation of the carbohydrates, and they can be obtained in artificial cultures either by similar fermentation or by the addition of organic acids, acetic, butyric, etc."

He found that when media are inoculated with root tubercles under anaerobic conditions anaerobic bacteria closely resembling the *Clostridium pasteurianum* of Winogradski, and which certainly belong to the butyric acid group, are always produced. The anaerobes of the root tubercles live in contact with aerobic organisms by symbiosis. The best methods of cultivating the organisms are discussed.

Experiments on the accumulation of nitrogen in forest soils, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 13 (1907), No. 19, pp. 580, 581*).—This is a brief note based upon investigations by E. Henry which have already been noted (E. S. R., 18, p. 550).

Fixation of free nitrogen, nitrification, etc. (*Jahresber. Gärungs-Organismen, 15 (1904), pp. 395–447*).—Reports of investigations during the year 1904 on fixation of free nitrogen, denitrification, nitrification, preservation of manure, and related micro-biological activities are reviewed.

On the assimilation of free nitrogen, J. DUMONT (*Sci. Agron., 1 (1906), No. 4, pp. 129–147; 2 (1907), No. 1, pp. 1–13*).—This is a critical review of the history and present status of scientific investigation relating to symbiotic and nonsymbiotic fixation of nitrogen, discussing especially Jamieson's theory and raising a question as to whether symbiotic fixation and assimilation of nitrogen is the only means whereby leguminous plants acquire nitrogen from the air.

A possible mission of ferments (micro-organisms) in the soil, T. F. SEDGWICK (*Internat. Sugar Jour., 9 (1907), No. 103, pp. 343–348; Estac. Expt. Cana Azúcar [Peru], Bol. 5, pp. 11*).—The function of micro-organisms in rendering innocuous the toxic substances excreted by the roots of plants and the soil conditions suited to this action are treated briefly.

Studies of the effect of varying amounts of 1 per cent citric acid on soils well supplied with carbonate of lime are reported from which the following conclusions and deductions are drawn:

"If a soil containing carbonate of lime be treated with citric acid and is still kept alkaline, a fermentation will slowly set up in the soil and solution showing that decomposition is taking place. If the fermentation is allowed to continue long enough, a deposit will be formed which, if obtained on a filter, washed with distilled water and treated with a dilute acid, will give the reaction for carbonates. This deposit will contain calcium, iron, phosphoric acid, etc. The liquid from the filtrate will be colorless and clear as water while the original citrate liquid from the soil is strongly yellow on account of the presence of iron. The clear liquid contains acetates, showing the change by fermentation from citrates to acetates. Upon standing for a long time it will not change. It is quite possible that if changes could be made to take place they would result in the final changes to the humus compounds. If the citric acid solution is allowed to remain on the soil for a number of months the soil will turn to the black of humus soils, showing that the decomposition leads to the formation of the humus compounds.

"The deductions that may be drawn from these experiments and observations are that, for these soils, the compounds in the soil produced by the action of roots and probably other organic materials of the soil are broken up through the agency of growing ferments, so that carbonates are returned to the soil maintaining its alkalinity, and certain food elements in a very soluble form are liberated: that these ferments to develop and cause decomposition must have an alkaline environment; and that the rapidity of the decomposition is in proportion to the activity of the ferment."

Treatment of soils with carbon bisulphid, B. HEINZE (*Centbl. Bakt. [etc.], 2. Abt., 18 (1907), Nos. 1–3, pp. 56–74; 7–9, pp. 246–264; 13–15, pp. 462–470; 19–21, pp. 624–634; 24–25, pp. 790–798; abs. in Jour. Chem. Soc. [London], 92*

(1907), Nos. 534, II, p. 295; 535, II, p. 388; 536, II, p. 502; 537, II, p. 572; Chem. Zentbl., 1907, II, No. 3, p. 270; Chem. Abs., 2 (1908), No. 1, p. 160).—The literature of investigations on this subject is reviewed and experiments with treated and untreated soils extending over two years are reported.

The methods used in detecting and determining carbon bisulphid in the treated soils at different stages as well as in studying the effect of the treatment on the biological and chemical processes in the soil are described. It was found that treatment with carbon bisulphid increased the yield of rye grain 40 to 50 per cent and straw 30 to 40 per cent and that the beneficial effect of the treatment extended into the second season. The yield of oats, potatoes, sugar beets, and grapes was also increased by the treatment. This increase in productiveness occurred notwithstanding the fact that nitrification was retarded to a marked extent in the sandy soils by treatment with carbon bisulphid. However, this retarding effect prevented excessive nitrification and waste in the earlier stages and disappeared after a time, being followed by an accelerated nitrification. The increased productiveness of the treated soil is, however, ascribed mainly to the action of the carbon bisulphid in promoting the activity of Azotobacter and other nitrogen-fixing organisms through preservation of the organic matter of the soil, as well as of organisms, molds, etc., which produce carbon dioxid and other acids in the soil, and thus increase the amount of available mineral constituents of plant food. The carbon bisulphid treatment also destroys plant parasites of an animal nature as well as weeds and is an effective means of overcoming soil sickness in case of grapes and leguminous plants. It was observed that the total nitrogen was considerably larger in soils treated with carbon bisulphid than in untreated soil.

The treatment of air-dry soils with carbon bisulphid increased to a marked extent the soluble potash, magnesia, and lime, while such treatment of fresh soils resulted in a large increase of sulphuric acid.

Pot experiments in which the soil was treated with bisulphid just before planting are reported which indicate that such treatment by retarding nitrification will serve as a means of judging the extent of dependence of a given plant upon nitrogen in the form of nitrates. It was found that other sulphur compounds, as well as mustard oil, and the green substance of mustard plants, acted like carbon bisulphid in retarding nitrification. This suggests an explanation of the unusually good results which have frequently been observed to follow the use of mustard as a green manure.

Contributions to natural pure cultures, F. Stockhausen (*Wchnschr. Brau., 24 (1907), Nos. 22, pp. 285–289; 23, pp. 301–304; 24, pp. 313–316; 25, pp. 325–331*).—This is a series of short reviews of the principal recent contributions to the subject of the natural conditions of development of pure cultures of organisms decomposing cellulose, reducing nitrates, producing vinegar and enzyms of different kinds, and various other reactions with special reference to the recent contributions to this subject of Beijerinck and his pupils.

The efficiency of soil inoculation in the production of root tubercles, F. L. [illegible]ens (*Science, n. ser., 26 (1907), No. 662, p. 311*).—This is an abstract of a paper read before the North Carolina Academy of Science in which "data were given concerning the inoculation of soils with liquid cultures obtained from [this Department]. From many tests conducted in various ways there was no evidence whatever that inoculation with these cultures was efficient in the production of tubercles upon legumes. The cultures employed were issued in liquid condition in hermetically sealed test-tubes, and were obtained directly from the Bureau of Plant Industry."

Soil bacteriology and the fertilizer question with especial reference to the fertilizing of clover, F. Löhnis (*Mitt. Okonom. Gesell. Sachsen, 1906–7, pp.*

31–49).—This is a general popular discussion of the bearing of bacterial activity on soil fertility with reference to "clover sickness" and other conditions affecting the growth of this plant.

Denitrification, Behn (*Jahresber. Angew. Bot., 3* (*1904–5*), *pp. 137–165*).—This is a review of the development and present status of the denitrification question.

On the conservation of nitrogen in manure, T. Macfarlane (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 12* (*1906*), *Sec. III, pp. 37–43, figs. 2*).—This is a brief account of a continuation of previous experiments (E. S. R., 17, p. 345). The experiments reported in this article were made to test the effect of treatment with nitric and sulphuric acids and artificial heat on the recovery of nitrogen. The results indicate that "a complete recovery of the nitrogen in urea is quite possible if a certain quantity of acid is used and the water is expelled gradually by artificial heat." Other experiments indicated "that in the spontaneous evaporation of urine and the decomposition of its urea all the nitrogen is not eliminated in the form of ammonia, otherwise it would have been retained by the large amount of acid used."

Chicken manure as fertilizer, A. Mankovski (*Selsk. Khoz., 22, No. 10; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*) *No. 2, p. 206*).—The application of chicken manure suitably pulverized and sifted gave satisfactory results with wheat and millet, and with beets, cucumbers, squashes, and potatoes.

Artificial fertilizers: Their nature and functions, A. D. Hall (*Sci. Amer. Sup., 63* (*1907*), *Nos. 1640, pp. 26273, 26274, fig. 1; 1641, pp. 26293–26295; 1642, pp. 26310, 26311; 1643, pp. 26318, 26319; 64* (*1907*), *No. 1644, pp. 13–15, fig. 1*).—A reprint. The original has been noted (E. S. R., 18, p. 921).

Experiments on the application of artificial fertilizers on the chernozem of the Voronej Government, M. S. Karpov (*Vyestnik Selsk. Khoz., 1906, No. 39; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 2, pp. 210, 211*).—The author reports the results of the application, in field experiments on chernozem, of 30 per cent potash salt, superphosphate, nitrate of soda, ashes, and manure (in different combinations) under winter rye and wheat. The experiments indicate in general the profitableness of the use of mineral fertilizers under the given conditions.

Experimental field of the Moscow Agricultural Institute, 1903–1905, A. A. Kaluzhski (*Izv. Moskov. Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *12* (*1906*), *No. 3, pp. 308–399, pl. 1*).—This report is divided into six parts treating, respectively, of winter cereals, summer cereals, grasses, potatoes, experiments with fertilizers, and experiments with straw. Fertilizer experiments with oats are described in which the effect of wood ashes was tested. It was found that moderate quantities of ashes (267.19 lbs. per acre) considerably increased the yield, while larger quantities caused a falling off in yield. Straw (rye), dry and comminuted, plowed under oats and rye lowered the yield.

Experiments to test the applicability of certain new fertilizing materials (*Deut. Landw. Presse, 34* (*1907*), *No. 65, pp. 525, 526*).—Experiments with agricultural lime and nitrogen lime by Petersen at the experiment station of Oldenburg in 1906 are briefly reported.

The use of calcium cyanamid in sugar-beet culture, A. Aulard (*Bul. Assoc. Chim. Sucr. et Distill., 24* (*1907*), *No. 12, pp. 1653–1660; abs. in Chem. Zentbl., 1907, II, No. 19, p. 1651*).—This is a brief note referring to a compilation of results of experiments in different countries, but especially in Italy. It is stated that the results show in general that the calcium cyanamid compared favorably with sodium nitrate and ammonium sulphate as a nitrogenous fertilizer for sugar beets and indicate great future possibilities for such products when the processes and plants engaged in their manufacture are more fully developed.

Under what conditions is ammonium sulphate most effective as a fertilizer? Müller (*Deut. Landw. Presse, 34 (1907), No. 67, p. 539*).—Among the conditions named as essential to the most efficient action of the ammonium sulphate are an abundant supply of potash in the soil, incorporation of the sulphate in the soil immediately after application, or when the material is used as a top-dressing application some time before the planting of the crop.

Experiments with mineral fertilizers in the Moscow Government in 1905 (*Abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, p. 197*).—Experiments were made with fertilizers in 9 districts. Phosphates were applied to cereals and potatoes, and gypsum to clover. Bone meal gave excellent results on rye. Gypsum increased the yield of clover by one-third as compared with nonfertilized clover.

Artificial fertilizers in peasant farming, A. Dubenski (*Selsk. Khoz. i. Lycsov., 1906, No. 9, pp. 355–373; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, pp. 203, 204*).—The author sums up the results obtained on demonstration fields with phosphatic fertilizers. The experiments were carried out on plats belonging to peasants. The practical importance of these tests is indicated by the fact that while in 1899 only 5 peasants applied about 7,286 lbs., in 1903 1,204 peasants applied about 714,980 lbs. of bone meal. On an average, a nonfertilized acre gave about 347 lbs. of winter rye and a fertilized one 689 lbs. Bone meal was applied at the rate of about 267 lbs. per acre.

The fertilizing value of plaster, J. Dumont (*Sci. Agron., 2 (1907), No. 4, pp. 257–274*).—The history of investigations on this subject is briefly reviewed and the action of plaster as a stimulant, plant food, absorbent, and mobilizer of plant food in the soil is discussed in some detail.

Influence of lime in connection with different phosphatic fertilizers, A. Otryzanev (*Vyestnik Selsk. Khoz., 1906, No. 37; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, pp. 204–206*).—Pot experiments were made with oats, applying the phosphates with lime. The effect was satisfactory only when superphosphate was used. In the presence of lime the action of Thomas slag was reduced and the action of the still more difficultly soluble phosphates (bone meal and phosphorite) was reduced to a greater extent. Similar results were obtained with winter rye.

On the use of calcium carbonate as a stable absorbent, O. Hofman-Bang (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 1, pp. 47–49*).—The manure from 28 steers was weighed for 14 days in March, 1906, and to one-half thereof 5 per cent of $CaCO_3$ (air-slaked lime) was added. The manure was placed in two piles and left for 7 months. The original weights were 4,762 kg. for the one, and 4,996 kg. for the other pile, the weight of the bedding being included in both cases, and that of 249 kg. of lime in the latter.

At the end of the trial one pile had lost 59 per cent in weight and the other 53.5 per cent, showing that the losses in the manure during storage were increased through the addition of calcium carbonate. Analyses made May 12 and September 10 showed that the limed pile contained 0.43 and 0.39 per cent of nitrogen against 0.44 and 0.43 per cent for the other pile on the two dates given.

Use of manganese compounds as fertilizers, W. Van Dam (*Chem. Weekbl., 4 (1907), pp. 391–397; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 538; II, p. 649*).—When seeds were soaked in manganese sulphate solution or the salt used as a fertilizer the yield was increased and the plants had a darker green color, due, it is thought, to intensified chlorophyll formation and hence greater elaboration of organic matter.

An investigation on intensive nitrification and the establishment of high-yielding niter beds, MÜNTZ and LAINÉ (*Ann. Inst. Nat. Agron., 2. ser., 6 (1907), No. 1, pp. 15–143, figs. 4; Ann. Chim. et Phys., 8. ser., 11 (1907), Aug., pp. 439–574, figs. 4; abs. in Chem. Zentbl., 1907, II, No. 11, p. 937*).—This is a detailed account of investigations briefly reported elsewhere (E. S. R., 18, pp, 323, 430).

New nitrogenous manures (*Agr. Students' Gaz., n. ser., 13 (1907), No. 4, pp. 125–128*).—Progress in the manufacture and agricultural use of calcium cyanamid and basic lime nitrate is briefly reviewed. It is stated that since the processes of preparing these compounds depend on the production of cheap electric power they are likely to be economically produced only in countries rich in natural water power.

The preparation of nitrogen-oxygen compounds from the air by electrical means, B. SPRINGFELDT (*Elektrochem. Ztschr., 14 (1907), No. 5, pp. 91–95, figs. 11*).—Processes and apparatus proposed for this purpose are briefly described.

Nitrate facts and figures, A. F. B. JAMES (*London, 1907; rev. in Chem. News, 95 (1907), No. 2483, p. 310*).—This is a compilation of data relating to companies now in existence and their directors, date of formation, capital, dividends, reserve funds, output, etc.

Chemical manures in Egypt (*Chem. Trade Jour., 41 (1907), No. 1075, pp. 581, 582; Dipl. and Consular Rpts. [London], Ann. Ser., 1907, No. 3869, p. 30; abs. in Jour. Soc. Chem. Indus., 26 (1907), Nos. 17, p. 979; 23, p. 1248; Holland Abroad, For. Ser., 15 (1908), Jan. pp. 15, 16*).—The import and use of chemical fertilizers in Egypt are briefly discussed. The imports in 1906 are stated to have been 12,725 tons valued at $606,550.59. There has been a rapid increase in the use of manures in this country in recent years, due mainly to the work of the Khedivial Agricultural Society. The greater part of the imports is from the United Kingdom, but a large (about two-thirds) and rapidly increasing proportion is obtained from Belgium. The principal native manures, "sabak," river and canal mud, stable refuse, etc., are entirely inadequate to meet the requirements of increased production of cotton and other crops in Egypt, and the only manures manufactured in Egypt are poudrette and other sewage products prepared by a company at Cairo. There is no monopoly for the import of artificial fertilizers, and the government is encouraging the free use of chemical manures. There was a very large increase of imports of fertilizers from the United States during the year.

The consumption of Stassfurt potash salts in France and other countries, MAIZIÈRES (*Engrais, 21 (1906), No. 40, pp. 975, 976; abs. in Chem. Abs., 1 (1907), No. 15, p. 2017*).—Statistics and a plea for greater use of potash salts in France.

Phosphates and superphosphates, T. COLLOT (*Jour. Agr. Prat., n. ser., 13 (1907), No. 23, pp. 714–717; 14 (1907), No. 30, pp. 108–111*).—This article gives statistics of the production and consumption of phosphates and superphosphates, particularly in France, and a brief history of the manufacture of superphosphates in France and of the discovery of phosphate deposits, and discusses the economic causes for the extension of the uses of phosphates and superphosphates.

Wool fertilizer (*Engrais, 22 (1907), No. 34, pp. 805, 806; Jour. Soc. Agr. Brabant et Hainaut, 52 (1907), No. 33, pp. 839, 840*).—This is a brief note explaining the general character of various kinds of wool refuse used as fertilizer and common forms of adulteration of these products, including mixture with tannery refuse and with refuse solutions obtained in the manufacture of ammonia, the latter being particularly injurious on account of their high content of sulphocyanids.

Commercial fertilizers and chemicals, T. G. Hudson, J. M. McCandless, et al. (*Bul. Ga. Dept. Agr., 1907, No. 44, pp. 196*).—This is the quarterly report on inspection of fertilizers in Georgia up to August 1, 1907, containing also information regarding the nature and use of fertilizers, fertilizer legislation, pure foods, and food standards and regulations.

Commercial fertilizers, F. D. Coburn (*Quart. Rpt. Kans. Bd. Agr., 26 (1907), No. 103, pp. 126–129*).—This is a final report under the fertilizer law of 1903, and includes a financial statement and the text of the new fertilizer law (see below), which became effective September 30, 1907, and which places the inspection in charge of the director of the agricultural experiment station, taking it out of the hands of the secretary of the State board of agriculture.

Kansas law regulating the sale of commercial fertilizers, C. W. Burkett and J. T. Willard (*Kansas Sta. Bul. 148, pp. 9*).—The text of the law which went into effect September 30, 1907, is given, with explanatory notes.

The law exempts from inspection raw materials in the hands of manufacturers, salt, lime, gypsum, or the dung of domestic animals, when sold as such, and each unmixed with anything else. It requires a guaranty of minimum percentage of the following constituents: Phosphorus in phosphates soluble in water, phosphorus in reverted phosphates, phosphorus in insoluble phosphates, total phosphorus, potassium in compounds soluble in water, nitrogen in nitrates, nitrogen in ammonium salts, and total nitrogen, together with the maximum percentage of chlorin in compounds soluble in water. It also requires that the fertilizer shall contain no horn, hoof, hair, feathers, or similarly inert nitrogenous matter. "Any manufacturer desiring to do so may waive the privilege of stating the percentage of nitrogen in nitrates and nitrogen in ammonium salts.

"The manufacturer or seller shall also state the sources of the constituents of the brand of fertilizer offered for registration, which statement and the information contained therein shall be recorded for reference, but shall not be disclosed by the said director unless the materials used are such as are liable to lower the standard of the fertilizer or give it deleterious properties."

The methods of the Association of Official Agricultural Chemists are to be used in the analysis of the fertilizers. A tax of 25 cts. per ton is charged, and tags must be attached to each 200 lbs. or fraction thereof. The enforcement of the law is placed in the hands of the director of the agricultural experiment station. Violations of the law are punishable by a fine of "not less than $50 nor more than $200 and costs for the first offense, and not less than $100 nor more than $500 and costs for each subsequent offense; provided, that any seller shall be exempt from the penalty for sale of fertilizers that are below the guaranteed standard if he has a written guaranty from the manufacturer or seller of the fertilizer that said fertilizer is registered and of the guaranteed composition, if said manufacturer or seller is a resident of the State of Kansas."

The experiment station is required to publish at least annually a bulletin giving the results of inspection.

Inspection and analyses of cotton-seed meal on sale in Mississippi, W. F. Hand et al. (*Mississippi Sta. Bul. 104, pp. 25*).—This bulletin reports analyses of 242 samples of cotton-seed meal and discusses the fertilizing value of this material and the quality of the product on the market in Mississippi. The law of that State requires that cotton-seed meal shall be guaranteed, branded, and sold as (1) high-grade cotton-seed meal containing at least 6.18 per cent of nitrogen, (2) standing grade cotton-seed meal containing at least 4.95 per cent of nitrogen, and (3) off-grade cotton-seed meal containing less than 4.95 per cent of nitrogen. The analyses reported show that only 23 samples, or 9.5 per cent of the meals examined, contained a lower percentage of nitrogen than that guaranteed by the manufacturer, the discrepancies being as a rule small. "The results show, therefore, that farmers have very generally received meal practically as good or better in quality than that indicated by the guaranteed analysis attached to each bag of meal sold in the State."

Analyses and valuations of commercial fertilizers, C. S. CATHCART, J. W. KELLOGG, and V. J. CARBERRY (*New Jersey Stas. Bul. 206, pp. 35*).—This bulletin contains analyses and valuations of 261 brands of fertilizers examined during the season 1906–7, and also of 114 samples of fertilizer supplies, 9 home mixtures, and 22 special compounds.

Commercial fertilizers and poisonous insecticides in 1906–7, G. S. FRAPS (*Texas Sta. Bul. 96, pp. 24*).—Analyses and valuations of 277 samples of fertilizers examined during the year are reported, with explanations regarding the methods of conducting the inspection and a brief discussion of the composition, valuation, mixing, changes in storage, and application of fertilizers for different crops, particularly cotton, corn, rice, and potatoes. Determinations of water-soluble phosphoric acid in samples of 12 different brands of fertilizers in 1905 and again in 1907 showed a decline in percentage of this constituent during this period in almost every case, the average for the 12 samples in 1905 being 6.73 per cent and in 1907, 6.33 per cent. The amount of fertilizer sold in Texas during the year is given as 19,200 tons, not including cotton-seed meal.

AGRICULTURAL BOTANY.

Comparative tolerance of various plants for the salts common in alkali soils, T. H. KEARNEY and L. L. HARTER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 113, pp. 22*).—In a previous publication (E. S. R., 13, p. 918) an account was given of the results of experiments upon the toxicity of certain salts of magnesium and sodium to young seedlings of the white lupine and of alfalfa.

In the present paper the results of experiments with single (pure) solutions of sodium carbonate, chlorid, sulphate, and bicarbonate, and magnesium chlorid and sulphate are given, in which their effects upon maize, 4 varieties of sorghum, 2 varieties of oats, 2 species of cotton, and sugar beets are described. Attention is called to the fact that these experiments were carried on in water cultures and that they are not directly comparable with the results which might be obtained in soil cultures, as the physical factors of the soil would doubtless modify the effect of the solutions on the plants.

It was found in general that different varieties of the same species differ considerably in their powers of resistance to the action of magnesium and sodium salts in pure solutions. Closely related species of the same genus also showed similar differences. Great differences were found to exist between different plant species in their resistance to pure salt solutions, not only as regards the absolute toxicity of the salt, but also the relative order of the toxicity of the salts. Of the 8 species investigated, maize was found on the whole to be the most resistant to pure solutions and cotton the least. Seedlings grown from fresh seed were found to be more resistant than those developed from older seed.

In addition to experiments with the single salts, various combinations were used. It was found that the presence of calcium sulphate in excess diminishes the toxicity of magnesium and sodium salts to all the plants tested, the neutralizing effect being greatest in the case of magnesium sulphate and least in that of sodium carbonate. As a rule the more sensitive the species to the pure solution, the greater was the counteracting effect of the calcium salt.

Amounts of calcium sulphate smaller than that necessary to saturate the mixed solution showed a marked neutralizing effect upon the more toxic salt, but the minimum amount of calcium sulphate capable of producing such effect remains to be determined. For the white lupine the presence of 0.5 gm. of calcium sulphate was found as effective as seven times that amount in neutralizing sodium chlorid, while for sorghum 0.1 gm. was as effective as twenty times that amount. To secure the most effective possible neutralization of sodium chlorid five times as much calcium sulphate was required in the case of the white lupine as in that of the sorghum, although the limits for these two plants were approximately the same both in pure sodium chlorid and in sodium chlorid with an excess of calcium sulphate.

While it was found impossible to compare the resistance of the different plants to pure solutions of the single salts with that of the same species in different combinations of alkali salts occurring in western soils, their behavior in mixed solutions showed a close approximation to that observed under natural conditions.

The soil preferences of alpine and subalpine plants, M. L. Fernald (*Rhodora, 9 (1907), No. 105, pp. 149–193*).—The results are given of a prolonged study of several hundred species of alpine and subalpine plants to ascertain the factors determining their distribution. The author claims that precipitation, exposure, fineness of soil particles, and water content of soils are of secondary importance in determining the presence of certain species of plants. The controlling factor is held to be the chemical nature of the soil, and striking coincidences are noted between the soil-forming rocks of mountains and cliffs and the distribution of the plants which cover them. In the regions studied it was found that the distribution of plants is largely controlled by the preponderance in the soil of potassium, calcium, and magnesium, although it was found in certain areas that soda, iron, and other elements were of equal importance in determining the range of plants.

The production of deleterious excretions by roots, O. Schreiner and H. S. Reed (*Bul. Torrey Bot. Club, 34 (1907), No. 6, pp. 279–303, fig. 1*).—Seedlings of wheat, oats, maize, and cowpeas were grown in agar in specially constructed tubes placed in glass vials attached to a clinostat. The roots developed in the agar and gave indications of chemotropism, which was attributed to deleterious substances excreted by the roots.

The authors, summarizing the results of their investigation, state that their experiments show that healthy growing plants excrete from their roots substances which have a deleterious effect upon the growth of the root. The excreta produced by the roots are so small in amount as not to be detected by chemical analysis, but the chemotropic sensitiveness of the plant demonstrates experimentally the presence of root excreta.

It was found as a rule that the excreta produced by a given plant are more toxic to plants of that same species than to others, and, so far as studied, are more toxic to closely related species than to those more distantly related.

The production of toxic excretions by the roots of the higher plants, it is held, appears to afford an explanation of some of the important phenomena connected with association, invasion, and succession of plants.

The galvanotropism of roots, Jessie S. Bayliss (*Ann. Bot. [London], 21 (1907), No. 83, pp. 387–405, figs. 4, dgms. 2*).—This is an account of experiments with seedlings of beans, maize, peas, sunflowers, pumpkins, and castor beans, in which the effect of a galvanic current upon the roots was tested.

In discussing the results the author states that there is sufficient evidence to connect the galvanotropic curvatures with those of a chemotropic character, the chemical stimuli being the acid and alkaline ions formed during electrolysis. This is supported by the fact that acids and alkalis are formed in appreciable quantities at the places where the positive and negative electrodes touch the roots. Similar curvatures to galvanotropic ones are produced by acids and alkalis placed on the sensitive zone of the root. If a piece of root tissue under a positive or negative electrode be cut out and applied to another root, the latter curves to the acid or alkaline tissue. Acids and alkalis applied to the sensitive zone of roots produce injuries similar to those produced by an electric current.

When an electrode is placed against the apex and another some distance beyond the elongating zone of the root, there is no curvature, as the acid or alkali is produced in the root cap and by diffusion affects the sensitive zone in all directions.

When nonpolarizable electrodes are used with a strength of current sufficient to produce a curvature if applied by polarizable electrodes, no curvature takes place.

The nodule organism of the Leguminosæ, F. C. Harrison and B. Barlow (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 12 (1906), pt. 1, Sec. IV, pp. 157–237, pls. 26*).—The results are given of a 2 years' study with the nodule organism of Leguminosæ, in which the authors describe their experiments in the isolation, cultivation, identification, and commercial application of the organism.

About 30 species of Leguminosæ belonging to the suborder Papilionaceæ were examined and nodules found on all, with the exception of the chick-pea and *Galega officinalis*, on which no bacteria were found. No nodules were found on the roots of Gymnocladus, Gleditschia, or *Cercis canadensis* belonging to the suborder Cæsalpineæ, but mycorrhiza were present in all cases.

In cultivating the organism the authors found that a medium composed of wood ashes, sugar, and agar-agar furnished an excellent medium for growth. The morphology of the bacteria taken directly from the nodules was found to vary with the species of plant, condition of infection and growth, age and size of the nodule, and the portion of the nodule examined. In plants belonging to the tribes Phaseoleæ, Hedysareæ, and Genisteæ, the bacteria were mostly small rods with comparatively few branching and irregular cells. In plants of the tribes Trifoliæ and Vicieæ, branching in irregular forms prevailed.

The viability of *Pseudomonas radicicola* from different plants was tested, the growth taking place on ash-maltose-agar, and while the limit of viability is not yet known, the organism will probably live more than two years on favorable agar and in favorable liquid media.

Accounts are given of the preparation of nitro-cultures together with the results of experiments in their use. It was found that the material could be prepared and distributed at a cost not exceeding 25 cts. an acre as compared with $2 or more per acre charged by some commercial firms. In tests of the material distributed, 91 out of the 134 of which reports were received, were successful and showed an increased growth of crop which is attributed to the nitrogen-assimilating organism.

The use of phytin as a source of phosphorus for some of the lower plants, A. Berthelot (*Compt. Rend. Soc. Biol.* [*Paris*], *63* (*1907*), *No. 26, pp. 192–194*).—A brief account is given of experiments with yeasts, bacteria, fungi, and algæ, in which phytin was used as a source of phosphorus in the culture media. According to the author, phytin occurs in seeds, tubers, and rhizomes in combination with calcium and magnesium, and is an important reserve material for the development of the embryo and the formation of new tissues in plants.

As a result of his experiments, the author found that for the lower plants phytin is a readily assimilable source of phosphorus, and as it appears to modify the production of diastases, toxins, pigments, etc., he thinks that it would influence the formation of chloroleucites and the progress of starch production.

Lectures on plant physiology, L. JOST, trans. by R. J. H. GIBSON (*Oxford, 1907, pp. XIV+564, figs. 172*).—This is an authorized English translation of Jost's Vorlesungen über Pflanzenphysiologie, which appeared some three years ago and which the author has brought up to the close of 1906. The original was based upon a course of lectures at the University of Strassburg, and the translator has performed his work as literally as possible, without attempting to edit the material in any way. Every chapter concludes with a bibliography of the more recent and authoritative works relating to the subject treated.

Plant physiology and ecology, F. E. CLEMENTS (*New York, 1907, pp. XV+315, figs. 125*).—The present text-book is based very largely on a previous work by the author entitled Research Methods. The material has been rewritten and rearranged into chapters, in which the plant is first considered as an individual and then as a member of a plant group or formation. The book is intended for use in classes in second-year botany in colleges and universities, and it has been given two years' trial by the author with good results.

Plant breeding, H. DE VRIES (*Chicago and London, 1907, pp. XIII+360, figs. 114*).—This is a series of essays on plant breeding, with comments on the work of the Svalöf Station in Sweden and that of Luther Burbank in California. As the work of Nilsson has only been published in Swedish and that of Burbank has not yet been described by himself, the book will give an authoritative account of the work of these two men in breeding agricultural and horticultural plants. The author regards the importance of the work of Nilsson and Burbank as inestimable. These investigators and others have shown the value of individual species which may be isolated by a single selection rather than by the more tedious and less accurate method of improvement by continuous selection.

In addition to descriptions of the methods and work of Nilsson, Hays, Burbank, and others, chapters are devoted to evolution and mutation, corn breeding, association of characters in plant breeding, and the geographical distribution of plants as affecting species.

Studies in variation, G. KLEBS (*Arch. Entwickl. Mech. Organ., 24 (1907), No. 1, pp. 29–113, figs. 15*).—An account is given of studies on *Sedum spectabile* in which the influence of various factors on the number and arrangement of leaves, number of flowers, and structure of floral organs is shown. A discussion of the relation of environment to variation and a bibliography complete the paper.

American root drugs, ALICE HENKEL (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 107, pp. 80, pls. 7, figs. 25*).—Descriptions are given of 50 drugs that are found in the United States, the list including the official root drugs as well as many nonofficial ones that are generally quoted in trade lists of the country. Under each plant is given the scientific and pharmacœpial names, common names, habitat, range, description of the plant and root, and information concerning collection, prices, and uses.

Seeds and plants imported during the period from December, 1905, to July, 1906. Inventory No. 21 (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 106, pp. 125*).—This inventory represents the accessions of the Office of Seed and Plant Introduction between December 15, 1905, and July 27, 1906. It contains 2,260 items, which were introduced for experimental purposes. Among the more important collections are those of F. N. Meyer, agricultural explorer in northern China, and a number of smaller collections are noted. In addition to the names of the plants, brief accounts are given as to their habits of growth, uses, etc.

FIELD CROPS.

The problem of the unequal efficiency of our cultivated plants, S. STRAKOSCH (*Das Problem der Ungleichen Arbeitsleistung unserer Kulturpflanzen. Berlin, 1907, pp. IX+116*).—In this book the author discusses and defines what he terms the "assimilatory effect" in plants, outlines the method of its determination, and explains its application in crop rotation and crop culture generally.

The "assimilatory effect" is the quotient derived from the value of the utilizable substance which a crop produces upon a given area and the value of the quantity of plant-food elements taken from the soil to produce this substance.

The results of the author's calculations are summarized in the following table:

Estimated relative value of different crops as based on the utilizable substance produced and the plant food consumed by an average yield per hectare.

Crop	Production of starch.	Production of digestible albuminoids.	Value of product.	Value of plant food consumed.	"Assimilatory effect."	"Assimilatory effect" (rye=100).	Difference between production and consumption
	Kg	*Kg.*	*Marks.*	*Marks*			*Marks.*
Secale cereale	2,093.0	186.8	347	94.00	3.7	100	253.00
Triticum vulgare	2,684.0	274.1	449	121.00	3.8	103	328.00
Hordeum vulgare	2,492.5	156.8	426	92.20	4.6	124	334.00
Avena sativa	2,144.9	181.3	355	103.00	3.5	95	252.00
Zea mays	5,303.5	399.5	1,240	165.00	7.4	211	1,075.00
Oryza sativa	2,990.0	201.5	490	46.00	10.6	286	444.00
Andropogon sorghum	4,617.5	266.0	750	144.00	5.2	140	606.00
Polygonum fagopyrum	1,456.6	191.8	248	67.00	3.7	100	181.00
Pisum sativum	2,285.8	544.8	414	19.00	21.4	578	395.00
Vicia faba	3,075.0	762.2	560	39.00	14.3	387	521.00
Soja hispida	3,483.2	943.6	643	26.00	24.7	668	617.00
Lupinus luteus	1,683.2	540.8	311	20.00	15.5	419	291.00
Solanum tuberosum	5,509.0	52.0	868	156.00	5.5	149	712.00
Beta vulgaris	7,784.0	203.0	1,241	131.00	9.5	257	1,110.00
Brassica napus rapifera	3,799.0	167.0	612	199.00	3.1	84	427.00
Daucus carota	1,935.0	312.5	805	203.00	3.9	105	602.00
Helianthus tuberosus	8,650.0	290.0	1,385	224.00	6.2	167	1,161.00
Lolium perenne	1,908.0	234.0	323	188.00	1.7	46	135.00
Phleum pratense	3,640.0	260.0	599	243.00	2.5	68	356.00
Zea mays (green)	4,550.0	300.0	714	162.00	4.6	124	582.00
Trifolium pratense	2,716.0	476.0	175	31.90	14.9	403	443.10
Medicago sativa	2,912.0	544.0	512	40.42	12.6	340	503.58
Trifolium repens	1,232.0	266.0	220	16.36	13.4	362	203.64
Trifolium incarnatum	1,800.0	300.0	313	13.72	22.8	616	299.28
Anthyllis vulneraria	1,738.0	132.0	286	17.51	16.3	440	268.49
Hedysarum onobrychis	2,470.0	494.0	438	20.95	20.9	565	417.05
Ornithopus sativus	1,452.0	330.0	262	42.00	6.2	167	220.00
Vicia sativa	1,679.0	414.0	305	26.00	11.7	316	279.00
Brassica napus oleifera	4,103.1	384.9	682	171.00	3.9	105	511.00
Papaver somniferum	2,133.2	240.2	358	105.00	3.4	94	253.00
Andropogon sorghum saccharum	3,240.0	240.0	533	447.00	1.2	33	86.00

In the above table the figures referring to *Lolium perenne*, *Phleum pratense*, *Trifolium pratense*, *Medicago sativa*, *Trifolium repens*, *Trifolium incarnatum*, *Anthyllis vulneraria*, *Hedysarum onobrychis*, *Ornithopus sativus*, *Vicia sativa*, and *Andropogon sorghum saccharum* represent the green crop. In all other cases the figures given are based on the total crop of grain and straw or roots and leaves.

The forage and fiber crops in America, T. F. HUNT (*New York and London, 1907, pp. XXI+413, pl. 1, figs. 153, dgms. 4*).—This book discusses the characteristics of the forage and fiber crops grown in the United States and the results of experiments and experience as to their climatic and soil adaptation, cultural methods, insect enemies, fungus diseases, harvesting, use, and marketing. Five chapters of the book are devoted to perennial forage grasses, 1 to annual forage plants, 8 to leguminous forage plants, 1 to root crops, and 8 to fiber crops. The machines and implements used in cultivating, harvesting, and preparing some of the crops for market are described and illustrated.

The world's commercial products, W. G. FREEMAN and S. E. CHANDLER (*London, 1907, pp. VIII+391, pls. 12, figs. 408, maps 10*).—This book discusses in a popular manner the cultivation, harvesting, preparation for the market and for consumption, and the commerce of cereal, fruit, vegetable, fiber, drug, dye, spice, and other crops as carried on in different parts of the world. The list of subjects discussed in the work includes most of the common articles of commerce.

Guide to experiments conducted at Burgoyne (University) farm, Impington, and at other centers in the eastern counties, T. H. MIDDLETON (*Cambridge Univ., Dept. Agr., Guide to Expts., 1907, pp. 162, pls. 4, dgms. 5*).—The results of the experimental work carried on by the agricultural department of Cambridge University are presented in tabular form. The figures given include the crops harvested in 1906 and the experiments made in feeding live stock in the winter of 1906–7. The purpose of this publication is to present the records of experimental work in convenient form. Discussions in greater detail of the work are given in *The Journal of Agricultural Science* and in the farmers' bulletins issued by the department. These articles have been noted from time to time from these different sources.

[Soil moisture determinations], H. T. NOWELL (*Wyoming Sta. Rpt. 1907, pp. 70–114, fig. 1, charts 10*).—This is a part of the report of the irrigation engineer.

Observations on rainfall, irrigation, and evaporation were made on a number of plats growing different crops and variously irrigated. Taking as a basis the power of the plant to live and grow while the amount of moisture in the soil is at a minimum, it was found that in general alfalfa and oats subsisted with the least amount of soil moisture of any of the crops grown at the station, and these crops were followed by fall rye, field peas, spring rye, and Defiance wheat in the order named. Potatoes planted very wide apart in the rows used the smallest amount of soil moisture during their growth and field peas used the most. Defiance wheat apparently used the least moisture after potatoes, followed by alfalfa and oats, spring rye, and fall rye.

Comparisons of soil culture in this connection showed that deep plowing was beneficial, while subsoiling had no apparent effect. Shallow cultivation produced better results in retaining soil moisture than deep cultivation. Plats of grain planted in 8 in. rows retained more moisture than those planted in 16 in. rows, possibly because of the heavier stem in the 16 in. rows, the same amount of grain being sown per acre in the two cases.

[Work with field crops], B. C. BUFFUM (*Wyoming Sta. Rpt. 1907, pp. 38–58, figs. 4*).—The work with barley, sweet clover, and flax is briefly reported, and the results secured in moisture investigations are given at some length in tables.

Sweet clover proved to be the hardiest clover ever grown at the station and was found to be adapted to all kinds of soil, even to those containing large quantities of alkali and to dry uplands without irrigation. In 1905, 2 plats produced from 2 cuttings about 4.5 tons of hay per acre, while on 2 other plats a yield of 3.75 tons per acre was secured. The first 2 plats had not been irrigated, while the last 2 were irrigated for the second crop. An analysis made by the chemist of the station showed a total of 22 per cent of protein in one sample of the hay.

The experiments with flax at the station are reviewed and it is shown that in 1905 yields of flax seed from 8 different varieties ranged from 168 to 443.2 lbs. per acre.

Report of the chemists, H. G. Knight and F. E. Hepner (*Wyoming Sta. Rpt. 1907, pp. 63–67*).—In connection with brief notes on the various lines of work conducted by this department, analyses of summer and winter samples of western wheat grass (*Agropyron occidentale*), Indian millet (*Eriocoma cuspidata*), needle grass (*Stipa comata*), and prairie June grass (*Kœleria cristata*) are reported.

Experiments with oats, millet, and various legumes, A. M. Soule and P. O. Vanatter (*Virginia Sta. Bul. 168, pp. 261–290, figs. 11*).—Among the best varieties of spring oats tested were Silvermine, Texas Rust Proof, and New White Sensation, yielding 27.18, 26.53, and 25.98 bu. per acre, respectively. The seed of Silvermine, planted in 1905, contained 8.98 per cent of protein. The crop secured from this seed contained 16.20 per cent and the crop of 1906, 16.50 per cent. The seed of Texas Rust Proof, secured in 1905, contained 13.33 per cent of protein, and the resulting crop 13.81 per cent, while the crop of 1906 contained 15.14 per cent. The percentage of hulls of the different varieties of oats varied from 28 to 43 in the seed and from 30 to 43 in the resulting crop. Vetch and oats seeded in various proportions yielded from 0.90 to 1.57 tons of hay per acre, with the proportion of vetch in the green crop never more than 12.68 per cent and in many instances less than 2 per cent.

Among the best varieties of millet were German, Japanese, and Hungarian, yielding in 1905 and 1906 on an average 3.85, 2.80, and 2.42 tons of hay per acre, respectively.

Up to the present time Whippoorwill, Iron, New Era, and Black cowpeas have given the best results at the station for hay making, the average yields for the years 1905 and 1906 being 2.50, 2.43, 2.40, and 2.23 tons per acre, respectively. The following yields of hay were secured from soy beans: Ito San Yellow 2.56 tons per acre, Early Green 1.63 tons, Japanese Pea 1.90 tons, Hollybrook 2.95 tons, Mammoth Yellow 2.85 tons, and Extra Early Yellow 2.30 tons. The best average grain yields were as follows: Ito San Yellow 18.43 bu. per acre, Early Green 16.16 bu., Japanese Pea 15.20 bu., and Medium Green 14.53 bu. Inoculation tests with soy beans and field peas were without apparent results.

The best varieties of field beans grown at the station in 1905 and 1906 were Choice Navy, which made an average yield of 22.50 bu.; Burlingame, which produced 19.78 bu.; Choice Mediterranean, which produced 18.20 bu.; and White Marrowfat, which produced 17.75 bu. per acre. Canada field peas at the station have thus far failed to give a large enough yield of grain or hay to prove remunerative.

Report of the agronomist, R. E. Hyslop (*Wyoming Sta. Rpt. 1907, pp. 126–140, figs. 2*).—The lines of work conducted in the department of agronomy are briefly noted and the results of cooperative investigations of cereals by the station and the Bureau of Plant Industry of this Department in 1906 are tabulated.

Intercultural tillage of wheat and oats on ground worn out by continuous cropping resulted in maintaining a darker color in the growing crop throughout the season than on the plat where no cultivation was given. Field peas sown at a rate to supply 193,600 plants per acre produced 5,794 lbs. of straw and 606 lbs. of seed, which was a larger yield of both straw and seed than on the plats where the stand was thinner. The use of nitrate of soda in growing a plat of hulless barley apparently gave a large increase in the yield of straw and grain.

Single or continued selection in breeding work with individuals of cereals and leguminous crops, C. Fruwirth (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 5, pp. 477–531, pl. 1*).—This article consists of historical notes on plant selection, describes the different methods practiced, and discusses the possibility of substituting single selection for continued selection in plant breeding work based on the selection of individuals.

The classification of brewing barley from a technical and agricultural standpoint, with special reference to its nitrogen content. M. Hubert (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *6 (1907), No. 7, pp. 839–844*).—The discussion of this subject as based on the results and observations of numerous investigators leads to the conclusion that the yield and the nitrogen content of barley, as well as of other cereals, is largely dependent upon weather conditions prevailing from the blossoming period until maturity, and that special methods of fertilizing the soil can have no effect against the unfavorable influences of the season.

It is further pointed out that the cultivated varieties of barley, even those regarded as selected strains, are frequently mixtures of different species and that a chemical analysis of such a mixture, especially the determination of nitrogen, gives only average results which may differ considerably from the composition of the different individual species. Pure botanical varieties which may be separated out by Nilsson's method show a much greater regularity in chemical as well as in physiological characters than a mixture of different species.

The introduction of botanical purity is considered of advantage in the examination and classification of brewing barley and barley to be used for seed, which should show a minimum coefficient of purity of 95 per cent.

The valuation of brewing barley. E. Prior (*Amer. Brewers' Rev., 21 (1907), Nos. 4, pp. 163, 164; 5, pp. 224–226*).—The system of determining the value of brewing barley used in Vienna is described in detail.

It is pointed out that the determination of the impurities and the chaff of the barley indicates the degree of cleaning it has received, together with the percentage of kernels worth malting it contains; that the estimation of the degree of dissolution leads to conclusions relative to the behavior of the barley in the steep and, in conjunction with the protein content, also relative to the dissolution of the barley to be expected on the floor, and of the dissolution of the malt; and that the hectoliter weight, the 1,000 kernel weight, and the quantity of husk indicate the quantity of valuable substances the barley contains. By the degree of dissolution is meant the sum of the percentage of mealy kernels in the original barley and the percentage of steely kernels which become mealy after steeping and drying.

Imported low-grade clover and alfalfa seed, E. Brown and Mamie L. Crosby (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 111, pt. 3, pp. 18 pl. 1, fig. 1*).—Analyses of 61 samples of imported low-grade red clover seed, 5 samples of high-grade red clover seed, and 16 samples of imported low-grade alfalfa seed are reported and described.

The analyses of the low-grade clover seed showed the following average results: Red clover seed 74.06 per cent, other seeds 12.17 per cent, dirt and broken seed 13.83 per cent, kinds of weed seeds 29.7, weight of 1,000 red clover seeds 1,105.5 mg., germination of red clover seed 58.03 per cent, price per 100 lbs. at which seed was imported $7.61, seed that germinated in sample 43.16 per cent, actual cost of 100 lbs. of red clover seed that germinated $20.39. The 5 samples of high-grade red clover seed gave the following average results: Red clover seed 97.73 per cent, other seeds 0.85 per cent, dirt and broken seed

1.42 per cent, kinds of weed seeds 5.2, weight of 1,000 red clover seeds 1,580 mg., germination of red clover seed 98.8 per cent, price per 100 lbs. at which seed was offered for sale $15.05, seed that germinated in sample 96.55 per cent, actual cost of 100 lbs. of red clover seed that germinated $15.58. Many of the low-grade samples contained dodder, while in the 5 high-grade samples no dodder was present.

Analysis of 16 samples of imported low-grade alfalfa seed gave the following average results: Alfalfa seed 86.44 per cent, other seeds 4.89 per cent, dirt and broken seed 8.68 per cent, kinds of weed seeds 15.75, weight of 1,000 alfalfa seeds 1,580 mg., germination of alfalfa seed 51.47 per cent, price per 100 lbs. at which seed was imported $7.63, seed that germinated in sample 44.31 per cent, actual cost of 100 lbs. of alfalfa seed that germinated $18.78.

Growing alfalfa without irrigation in Washington, E. E. ELLIOTT (*Washington Sta. Bul. 80, pp. 32*).—This bulletin presents in a popular form the results of practical experiments carried on at the station farm, together with information on the practices of progressive farmers in the State.

Ten years' work has shown that on virgin soil a fair stand of alfalfa was readily secured and that a failure to secure a perfect stand was due to insufficient seed and improper methods of seeding. The field used yielded heavier crops from year to year and any cultivation given the ground gave good returns. A profitable second crop was secured in only one instance. The average annual value of the crop is estimated at about $10 per acre, although it is stated that in 1897, 1899, and 1900 it was considerably more.

In one experiment seed secured from Colorado gave much better results than seed from an unknown source. Good results have also been secured from Turkestan alfalfa.

A brief statement of approved methods of cultivation concludes the bulletin.

Farmers' institute bulletin, 1907, W. R. PERKINS (*Mississippi Sta. Bul. 103, pp. 16, figs. 8*).—This is a popular bulletin briefly outlining the methods of corn improvement and corn judging, and discussing the subjects of seed corn growing and testing.

The fibers of long-staple upland cottons, H. A. ALLARD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 111, pt. 2, pp. 7, pls. 2, figs. 3*).—This bulletin discusses briefly the apparent lack of uniformity of cotton fibers, and the true nature of the longer fibers.

With reference to the so-called long fibers the author states that "they are not longer fibers as they have been generally considered, but are caused by more or less curling and interweaving, which results in the pulling out of fibers from adjacent seeds."

Artificial fertilizers for cotton in the central provinces, D. CLOUSTON (*Agr. Jour. India, 2 (1907), No. 2, pp. 116–122*).—Nitrate of soda was applied at the rate of 130 lbs., sulphate of potash at the rate of 65 lbs., and superphosphate at the rate of 260 lbs. per acre, supplying 20, 35, and 50 lbs. of nitrogen, potash, and phosphoric acid, respectively. The season's results showed that nitrogen was the most important plant food on this particular black-cotton soil. When superphosphate and potash were applied with it there was a considerable gain, but the value of the increase was insufficient to cover the cost of these two substances. The plat receiving nitrogen alone produced 760 lbs. of seed cotton per acre, while the complete application produced 870 lbs., and nitrogen with either superphosphate or potash 800 lbs. per acre.

The milling properties of oats, R. B. GREIG and W. M. FINDLAY (*Jour. Bd. Agr. [London], 14 (1907), No. 5, pp. 257–268*).—Observations on the milling properties of oats showed that within the same variety clay soils produce a grain of high milling power and peaty soils one of low milling power. The difference is considered as probably due to the thinner husk and better matured kernels from clay lands. A dry season was found favorable to meal production, the grain containing less moisture and being better matured. Excessive nitrogenous manuring tended to thicken the husk, to delay ripening, and to decrease the percentage of water in the grain. Phosphates and potash appeared to increase the proportion of kernel and certainly accelerated ripening. It is stated that if oats are not carefully graded loss occurs because grains of unequal size do not dry uniformly, in shelling the larger grains are broken and the smaller escape, and very small grains are blown away with the husks.

A comparison of the milling properties of different varieties indicated that the milling value depends on the thickness of the husk and the shape of the kernel. It is pointed out that the relation of these two factors is not always apparent, and by way of illustration attention is called to the fact that the husk of Newmarket oats is actually thicker than the husk of Potato oats, although the proportion of husk in the Newmarket is less than in the Potato, so that Newmarket in spite of a thicker husk is the better milling variety. Varieties in which the kernel fills up and is closely covered by a thin husk have the highest milling value. It is stated that owing to the shape of the kernels of Newmarket, Abundance, and Thousand Dollar these varieties compete successfully as milling oats with Potato and Scotch Birlie. Storm King has a short pointed kernel and thick husk and is for this reason a poor milling variety.

Experiments on transmission in the potato, E. GRABNER (*Ztschr. Landw. Versuchsw. Österr., 10* (*1907*), *No. 7, pp. 607-647*).—The results of cooperative investigations carried on for several years showed that tubers from the best developed hills were more productive than those from smaller hills, and the conclusion is drawn that the yielding capacity may be increased by selecting tubers for seed from the heaviest hills.

Comparisons of the same quantity of seed by weight of small and large tubers resulted in the obtaining of the higher yields from the small tubers. The determination of size from the weight of the seed was not applicable in these experiments, nor was the starch content as based on the specific gravity of the seed tubers transmitted. The average results, however, indicated that starch content is a varietal character, and it is believed that its transmission, although influenced by several factors, is very probable.

Observations on the form of tuber in its relation to yield and starch content showed that within the variety globular seed tubers influenced the starch content while cylindrical tubers influenced the yield. No similar connection was observed between varieties with globular tubers and those of which cylindrical tubers are typical. It was found difficult to change the form of the tuber when this appears as a character of the variety.

Selection of potato varieties for distilleries, G. ROSSMAN (*Abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], 7 (*1906*), *No. 6, pp. 725, 726*).—Observations made at different experiment stations showed that larger yields of potatoes and a higher quality of tubers were secured on compact soils than on sandy soils, and that varieties with red tubers grew especially well on clay soils, but did not make as good a growth under these conditions as white varieties on light soils.

The violet Solanum commersoni, A. and P. ANDOUARD (*Bul. Sta. Agron. Loire-Inf., 1905-6, pp. 30-33*).—Several cultural experiments with the violet variety of *Solanum commersoni* are reported. In one instance an average of a little over 3 kg. of tubers per hill was secured from 40 hills, and in another test the yield corresponded to 29,000 kg. per hectare as compared with 10,000 kg. for the Early Rose potato grown under the same conditions.

Investigations on the morphological influence of fertilizers on the potato, P. Vageler (*Jour. Landw., 55 (1907), No. 3, pp. 193-214*).—The experiments were conducted on a newly reclaimed moor soil. Potash and phosphoric acid were applied at the rate of 300 kg. and nitrogen at the rate of 100 kg. per hectare, and these substances were given in different combinations. The potatoes were planted in rows 70 cm. apart, with 30 cm. between plants in the row. The methods of obtaining material for study and the technical processes of the investigation are described.

It was found that nitrogen on this kind of soil, with a precipitation of 1,200 mm., tends to increase the number of stems in the plant, and that the length of the stems is also favorably influenced. The effect upon the length of the stems, however, is not so marked as upon their number. This influence of nitrogen seemed to be brought about even when the other plant food elements were lacking in the soil. Potash also showed its influence on the number of stems, especially when phosphoric acid and nitrogen were lacking, but phosphoric acid under the same conditions had a greater influence on the length than upon the number of stems. It was found that when either potash or phosphoric acid was not included in the fertilizer application better results were obtained when potash was given than when phosphoric acid was applied.

With reference to the structure of the leaf, it was found that a complete application of minerals reduced the thickness of the leaf and that the thickness of the epidermis depended upon a large supply of potash and to a smaller extent upon the supply of phosphoric acid. Nitrogen remained almost neutral in this connection. The thickness of the loose parenchyma was found directly proportional to the quantity of the complete fertilizer used, while in the case of the palisade parenchyma the proportion was inverted.

Potato experiments in progress for 5 years on the experiment fields of the Podolsk agricultural society, F. Lubansky (*Abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 2, p. 231*).—The results secured are summarized in the following table:

Average results with different varieties of potatoes compared for 5 years.

Varieties.	Yield of tubers per acre.	Percentage of starch per acre.	Yield of starch per acre.
	Bu.	*Per cent.*	*Lbs.*
Kösternitz	353.07	20.6	435.99
Kaiserin Augusta	346.88	20.8	431.98
Wohltmann	341.70	21.0	485.90
Silesia	337.91	21.5	480.67
Maerker	336.80	20.6	415.93
Juwel	331.61	20.4	405.23
Imperator	300.60	19.4	438.83

The action of manganese on the potato and the sugar beet, A. Grégoire, I. Hendrick and E. Carpiaux (*Bul. Agr. [Brussels], 23 (1907), No. 6, pp. 388-394*).—The action of manganese on different crops as determined by various investigators is reviewed, and the authors' results with potatoes and sugar beets are briefly reported.

The application of 10 kg. of manganese sulphate per hectare had no effect upon the yield of potatoes, but an application of 50 kg. showed an appreciable increase amounting to 5 to 9 per cent in different varieties. The application of this substance had apparently no effect upon the yield of starch and it did not increase the resistance of the plants to attacks of potato rot. Where the manganese sulphate was used on soil well supplied with nitrogen its action was the same as on soil poor in nitrogen, and it is therefore concluded that the effect of this substance on the yields can not be attributed to its rendering the nitrogen of the soil more available.

In the experiments with sugar beets 500 kg. each of superphosphate, nitrate of soda, and kainit were applied per hectare, and the sulphate of manganese was applied in quantities of 10 and 50 kg. per hectare. The use of the manganese compound slightly lowered the yield of beets, but their sugar content was apparently raised in the same proportion, so that the yield of sugar on all plats was the same.

The chemical composition of beet seed, with special reference to the composition of the seed of several fodder beet varieties, O. Fallada (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Indus. Osterr.-Ungar., No. 187, pp. 1–5*).—The composition of beet seed as determined by different investigators is discussed and reported, together with the results obtained by the author. The results of analyses of the seed bolls of different varieties of beets are given in the following table:

Chemical composition of the seed bolls of fodder beets and sugar beets.

Varieties.	Moisture.	Albumin.	Nonalbuminoid nitrogen compounds.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.	Sand.
Fodder beets:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Mammuth	11.46	9.13	3.06	5.68	29.14	35.84	5.22	0.47
Oberndorf	11.20	9.13	3.43	5.62	30.81	33.50	5.97	.34
Eckendorf	12.48	9.31	3.31	4.84	23.56	40.81	6.10	.09
Sugar beet: Wohanka Ertragreiche	11.31	7.44	2.25	5.85	29.51	38.18	5.40	.06

The ash of the seed bolls of the Mammuth variety was found to contain 20.36 per cent of potash, 11.98 per cent of lime, and 8.21 per cent of phosphoric acid; the ash of Oberndorf 16.72 per cent of potash, 9.87 per cent of lime, and 12 per cent of phosphoric acid; and the ash of Eckendorf 18.59 per cent of potash, 9.30 per cent of lime, and 12.31 per cent of phosphoric acid. Analyses of the seed proper showed an average content of 21.82 per cent of potash, 4.06 per cent of lime, and 46.05 per cent of phosphoric acid.

The chemical composition of sugar-beet seed, F. Strohmer and O. Fallada (*Osterr. Ungar. Ztschr. Zuckerindus. u. Landw., 1906, No. 1, p. 12; abs. in Zentbl. Agr. Chem., 36 (1907), No. 5, pp. 324–326*).—The results presented show the following composition of sugar-beet seed: Nuclein 3.16 per cent, protein 17.25 per cent, amids 5.76 per cent, glycerids 17.82 per cent, phytostearin 0.96 per cent, lecithin 0.46 per cent, starch 19.58 per cent, pentosans 3.03 per cent, other nitrogen-free extract substances 24.70 per cent, crude fiber 1.90 per cent, oxalic acid 0.39 per cent, and ash 4.99 per cent. The ash includes 2.70 per cent of phosphoric acid, 1.09 per cent of potash, and 0.23 per cent of lime.

The results secured on the experiment fields of the Russian society of sugar manufacturers, S. L. Frankfort (*Abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *7, (1906), No. 6, pp. 696–698*).—It was observed that the average variation in the results was reduced in proportion to the fertility of the soil.

In 1905 better results were secured from the application of the fertilizer in the rows together with the seed than by broadcasting. During two seasons the seed and fertilizer were mixed in definite proportions and sown together in drills. The yield of beets was about the same as when the application of fertilizer in the row was made in the usual way, but the growth of the young plants was not so vigorous.

Thinning experiments led to the conclusion that beets may be grown wider apart in the row than has hitherto been practiced. While an increase in the distance between plants somewhat lowered the sugar content the yield of sugar secured was not perceptibly diminished.

The influence of different quantities of manure and commercial fertilizers applied to winter wheat on the succeeding beet crop, S. L. FRANKFORT (*Abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 7 (1906), No. 1, p. 53*).—Experiments conducted during 3 years showed that where barnyard manure failed to increase the yield of winter wheat the use of superphosphate or superphosphate and nitrate of soda alone, or in addition to the manure, were also without effect. Where manure gave a large increase in the yield of wheat superphosphate also proved of benefit, although the increase was not so marked as in the case of the manure. The use of superphosphate in conjunction with barnyard manure proved of but little benefit, while the application of nitrate of soda with superphosphate or of superphosphate with barnyard manure sometimes increased and sometimes decreased the yield, apparently because of weather conditions.

It is concluded that superphosphate and superphosphate with nitrate of soda applied separately or in combination with barnyard manure to winter cereals will increase the yield of a succeeding sugar-beet crop, and the statement is made that 1,000 pood (18 tons) of barnyard manure applied to a winter cereal and superphosphate applied directly to the succeeding beet crop, or superphosphate and nitrate of soda applied to the winter cereal is likely to give as large a yield of beets and sugar as 2,500 pood (45 tons) of barnyard manure applied to the winter cereal without the minerals.

Observations on the growth of winter wheat in the year 1905, G. KOZLOVSKI (*Abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 1, pp. 101, 102*).—It was observed that when the plants stooled to more than 5 or 6 stems, which is considered normal, the quality of the grain was reduced. The proper stooling of the plants and the vigorous growth in the fall seem to overcome all danger from frost. Soils having produced fallow crops contained less moisture throughout the entire year than soils which had been in bare fallow. The crop fallows were not so pervious to rain as the bare fallow soils.

HORTICULTURE.

Horticultural survey of [Texas] Gulf Coast, E. C. GREEN (*Texas Sta. Bul. 94, pp. 21, figs. 7*).—During the past 3 or 4 seasons, in which the Gulf Coast region of Texas between Corpus Christi and Brownsville has been open for settlement, the trucking industry has been developed to a considerable extent at various points. With the view of securing reliable information relative to the crops which have been thus far successfully grown, the author made a horticultural survey of this region during December, 1906. This bulletin consists of notes secured from successful truck growers at the different points visited.

Considerable information is given relative to kinds and varieties of vegetables grown at the different points, planting dates and distances, cultural methods, insects and diseases, together with data on yields and returns from the various crops. The general advice given to newcomers is that it is not wise to attempt special truck crops on the new land but rather to plant cotton and corn or sorghum the first season, thus subduing the wild land by plenty of culture with team tools. In any case, the crop plan as developed at the different points should be followed for the first season or two until the new settler becomes better acquainted with the country.

Horticulture in Egypt (*Gard. Chron., 3. ser., 42 (1907), Nos. 1073, pp. 41, 42; 1074, pp. 73, 74*).—A popular account of the extent and methods of cultivation of a large number of tropical and semitropical fruits and vegetables in Egypt.

Phenology as an aid to horticulture, E. MAWLEY (*Jour. Roy. Hort. Soc. [London], 32 (1907), pp. 52–57, dgms. 3*).—The author gives an account of the methods adopted by the Royal Meteorological Society in order to compare the dates of flowering of certain plants in different parts of Great Britain year after year.

Specimen tables and records are given, together with suggestions for the modification and use of these methods in private gardens.

Influence of the stock on the scion, G. RIVIÈRE (*Jour. Soc. Nat. Hort. France, 4. ser., 8 (1907), Mar., pp. 158–160*).—A summary is given of previous grafting experiments conducted by the author in conjunction with G. Bailhache, in which they found a variation in color, size, and content of sugar, acid, and dry matter with the fruits of both apples and pears when grafted on different stocks. Their recent investigations along the same line, which are noted, appear to demonstrate further that the products of the scion are influenced more or less by the stock. Among the stocks studied for pears the Cognassier appears to exert the best influence on the scion both with regard to increase in size of the fruit and increase in sugar content. Reference is made to a Doyenne d'Alencon pear grafted on a Doucin apple. While the growth of this tree is not vigorous, it is said to be 13 years of age and bore fruit for the first time in 1906.

The variations or sports which frequently occur among flowering plants, L. DUVAL (*Jardin, 21 (1907), No. 489, pp. 198–200*).—A discussion of the above subject, in which the author cites numerous instances of the occurrence of variations or sports among many of our flowering plants.

Report of the government horticultural and experimental fields in South Holland for 1906, C. H. CLAASSEN ET AL. (*Verslag Rijkstuinbouwproefvelden Zuid-Holland, 1906, pp. 109*).—During the season of 1906 over 150 cooperative cultural, variety, fertilizer, and spraying experiments were conducted with a large variety of fruits and vegetables in South Holland under the direction of the professor of horticulture at Boskoop. This pamphlet embraces reports of the various experimenters with regard to the experiments and tests undertaken in the different localities.

American varieties of garden beans, W. W. TRACY (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 109, pp. 173, pls. 24*).—A continuation of previous investigations on varieties of vegetables (E. S. R., 14, p. 657; 16, p. 871).

The author has made an extensive study of the varieties of garden beans listed by American seedsmen. The results of these studies are said to be based largely on variety tests conducted at Washington, D. C., and in various places in the States of Connecticut, New York, Minnesota, Nebraska, Missouri, California, and Washington.

Beans are said to be sold in the United States under more than 400 varietal names, and to have at least 185 distinct types. A summary is given of all the varieties desirable for home use and the market. A classification with key is also given of practically all of the distinct varieties now listed by American seedsmen, together with a description, comparative notes, synonyms, and history of each. A list is given of nearly all the garden beans catalogued today in America, embracing both distinct and subsidiary varieties, of which the latter have been found upon trial to be strains or duplicates of the distinct types. The text is accompanied by a large number of illustrations which, together with the descriptions, it is hoped will serve as a standard for the different bean varieties.

Introductory statements deal with the botanical relationship of bean species, the principles of classification, history of varieties, rules for description, and an explanation of the various characters referred to in the accompanying descriptions.

Celery culture, W. R. BEATTIE (*New York, 1907, pp. X+143, pl. 1, figs. 59*).—This book treats of the production of celery for home use and for market, including the selection of soil, production of plants, methods of cultivation, harvesting, packing, marketing, and uses. Consideration is also given to the selection of varieties for various purposes, the profits derived from celery culture, and seed production. The information given is based upon practical experience, together with observations of the methods employed by the most successful growers. The text is fully illustrated.

The best fruits at the beginning of the twentieth century (*Rev. in Jardin, 21 (1907), No. 490, p. 223*).—The National Horticultural Society of France has prepared a list of 250 fruit trees, which is intended as a guide for the selection of the best varieties. These are arranged in alphabetical order and the name, synonym, origin, and detailed descriptions of both tree and fruit are given.

Some little-known edible native fruits of the United States, H. H. RUSBY (*Jour. N. Y. Bot. Gard., 8 (1907), No. 92, pp. 175-188*).—A popular lecture on this subject delivered at the New York Botanical Garden, in which the author gives a descriptive account of a large number of our native fruits which at the present time are little used for food purposes but many of which it is believed are amenable to great improvement by modern methods of treatment.

Investigations on the dropping of young fruit, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 21 (1907), No. 5, pp. 215-225, figs. 12*).—The opinions of several investigators with regard to the causes leading to the premature dropping of the fruit are briefly considered and an account is given of the author's investigations to determine whether or not the seed of such fruit is fertilized before dropping.

The seeds of a large number of pears and apples of both fallen fruit and fruit picked from the tree were examined. From the tabulated results it appears that there is comparatively little difference between the number of seed and embryos formed in the fallen fruit and in fruit which remains on the tree, from which the author draws the conclusion that the dropping of young pears and apples does not stand in direct relation with the previous fertilization of these fruits.

Some figures are given illustrating the comparative development of self-dropped pears and pears plucked from the tree. In each case the normal pears appeared to be much better developed.

A treatise on citrus culture from seed to fruit, W. E. MASTERS (*Agr. Jour. Cape Good Hope, 30 (1907), Nos. 2, pp. 155-172; 3, pp. 307-325; 4, pp. 437-453; 5, pp. 605-630; 6, pp. 751-763, figs. 14*).—From his investigations of several years' duration in the propagation of citrus trees in South Africa, the author has elaborated a system of budding and grafting which is designated the "Masters training system." "Training," as this system is also called, is based primarily on the influence of the stock on the scion, which influence the author claims to have discovered quite by accident but to have further verified by his own work, together with a study of the results unwittingly secured by other orchardists.

In the present work the incidents which led to the development of "training" are described, the investigations and results upon which the author's conclusions are based are discussed at length, and the effort is made to show how "training" may be applied in reorganizing the citrus industry of South Africa on a firm basis, financially and otherwise. The lemon, Cape Seedling and Seville oranges, and pamplemous (pomelo) are compared with regard to their value as stocks, and consideration is given to seed bed and nursery practices, transplanting operations, the science of budding and grafting, and the Mal-di-gomma (root-rot).

According to the author the influences of the stock on citrus fruit are only conspicuous when "(1) the stock shall greatly differ from the fruit (as, for instance, the lemon and orange), and (2) when the stock is able to assert its full unchecked influences in complete affiliation with the scion and by ample moisture." As a result of his experience the lemon is severely discounted as a stock for the orange, since the fruit is said to partake of the nature of the stock and to become thereby acidulated.

The author attempts to show that high-grade fruit can only be produced by equally high-grade stocks, and "that the only way in which the growth of the grafted variety may be made to equal the growth of the stock is by constantly associating and reassociating, again and again, the tree carrying the scion that produces high-grade fruit with another stock similar in all respects to that on which the high-grade fruit is already growing and flourishing to perfection."

To bring about this result is the purpose of the "Masters training system," which consists of a series of budding and grafting known as first-union, second-union, and third-union grafting. A "training first-union" is defined, in substance, as a scion from any adult tree budded at or close to the crown of a stock which has been cut down. A "training second-union" is by preference a graft grown by the previous first union taken as soon as the wood is ripe and grafted on the same kind of stock again, which has been cut back to within about 4 in. of the crown. A "training third-union" is a graft or bud inserted some 10 or 12 in. above the surface of the soil, usually at the base of the main branches on the growing stock not cut down until later. In the first and second union grafting operations one stock sprout is allowed to grow along with the scion, and until the scion sprout practically equals the growth of the stock sprout the second union grafting operation is repeated. When the two growths are about equal, the third-union graft is made and the tree considered trained for the orchard.

The author claims for this system that although fruiting is retarded by the continued regrafting the growth in later years will be much more satisfactory, and, providing the fruit growing on the trees from which the stocks and scions originally came was of superior type, that the quality of the fruit will be superior to that of promiscuously grafted fruits.

Curing the lemon, W. J. ALLEN (*Agr. Gaz. N. S. Wales, 18 (1907), No. 6, pp. 503–510, figs. 10*).—A popular description of the process of curing lemons, together with the equipment used, based on practices employed in California.

On the dwarf coffee of the Sassandra, Coffea humilis, A. CHEVALIER (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 5, pp. 348–350*).—The author gives an account of the occurrence and distribution together with the botanical description of a new species of coffee found by M. Fleury on the Ivory Coast, and which the author has named *Coffea humilis.* The bush of this species is much smaller than other coffees and grows under dense forest shade. It is not very fruitful, however, and on this account is of value only as a botanical curiosity.

The cold storage of small fruits, S. H. Fulton (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 108, pp. 28, pls. 3*).—The author conducted investigations covering a period of 3 years relative to the factors affecting the keeping of small fruits in cold storage, including the influence of soil and climatic conditions, the time of picking, methods of handling, types of packages and wrappers, and the temperatures in the storage house, together with the effect of cold storage on the flavor and aroma of the fruit and the behavior of the fruit when withdrawn from storage. A number of these problems are to be studied further, and while the principles evolved from the tests thus far are believed to be correct the present report is regarded as preliminary rather than as conclusive and final. Results are also given of investigations made by H. C. Gore on the composition of the air in different types of packages and the influence of oxygen gas on the keeping quality of small fruits.

An outline is given of the experiments, the results are discussed in detail and are summarized in substance as follows: Small fruits, unlike most of the tree fruits, are not adapted to keeping for any length of time in cold storage, although cold storage is a considerable factor in preserving such fruits for short periods. They are sometimes stored in a frozen condition for weeks and even months for use by confectioners, bakers, and restaurateurs.

Berries grown upon low, moist soil usually break down more quickly in cold storage than berries of the same varieties grown upon a light, dry soil. Berries keep better when the moisture supply has been adequate for their sound healthy development than the same varieties stunted by drought or subjected to excessive rainfall. Small fruits designed for cold storage should be well matured and fully colored but firm. No apparent difference was noted in the keeping qualities of small fruits from early, medium, and late pickings. The fruit must be handled quickly and carefully in the field and on the way to the storage house to prevent ripening and bruising. With fruit stored for only 2 or 3 days, a temperature of 36 to 40° F. usually gives satisfactory results, although 32° F. is preferred. For somewhat longer periods a temperature of 30 to 32° F. is found more effective. When frozen for long keeping, small fruits are usually subjected to a temperature of 5 to 12° F.

In one test strawberries and raspberries were stored in close paper cartons lined with paraffined cardboard, in addition to which some of the cartons were wrapped with paraffined paper. Without the extra wrap the cartons preserved the fruit in good sound condition, freer from mold and tainted less by storage-house odors than fruit stored in open packages, whereas with the extra wrap they proved too tight and the fruit softened and had the characteristic bad flavor of fruit confined in an atmosphere of carbon dioxid. Wrapping baskets of berries in thin impervious paper aids materially in retaining the bright color and attractive appearance of the fruit, prevents the absorption of storage-house odors to a marked degree and retards to some extent the appearance of mold.

In the test to determine the influence of oxygen gas on the keeping quality of small fruits, several boxes of strawberries were exposed to the usual conditions of the open package and several were kept in a large glass bell jar in which the air was displaced with oxygen of 90 to 95 per cent purity and renewed at intervals of 2 to 4 days throughout the experiment. At the end of 16 days the jars were opened and the fruit compared with the exposed boxes. The fruit held in oxygen had a good color and flavor and was free from black mold, but was too soft for marketable purposes. The fruit in the open boxes had a good color but a bad flavor and was badly molded. A similar test was made with raspberries and as with the strawberries no effect attributable to the presence of oxygen was brought out, the difference between the inclosed and open lots appearing to be about that which occurs when fruit is stored for the same length of time in open and closed packages.

"Strawberries were kept in good condition in cold storage from 1 to 2 weeks; red raspberries, 2 to 3 days; black raspberries, 3 to 5 days; blackberries and dewberries, from a week to 10 days, and currants, 2 to 3 weeks. Cranberries kept all winter. Strawberries, raspberries, and blackberries which have been stored for several days usually begin to break down within 10 to 12 hours after removal from the storage, while currants and gooseberries hold up fom 12 to 24 hours longer."

The graft-stocks for dry soils, J. CAPUS (*Feuille Vin. Gironde, 32* (*1907*), *No. 32, p. 126*).—The author discusses the comparative value of American grape stocks for French vineyards. Vines grafted on Riparia are said to have proved unsatisfactory on dry soils both as to the growth of the vine and the quality of the wine. The author is of the opinion, however, that this fact should not lead to the conclusion that vines grafted on American stocks will give wine inferior to French vines and he briefly describes some experiments, the results of which indicate that certain hybrids of Cordifolia are adapted to soils with a high lime content and that the hybrids of Berlandieri are adapted to dry soils whether calcareous or not.

An account is also given of a test of the wines from 8 different graft-stocks all grafted with Cabernet-Sauvignon. As a result, Cordifolia × Rupestris produced the highest quality of wine. This test was repeated in 1906 under different weather conditions but with practically the same results.

Vine culture and wine trade of Germany, C. NIESSEN (*Diplo. and Cons. Rpts.* [*London*], *Misc. ser., 1907, No. 661, pp. 17*).—This is a report on the vine culture and wine trade of Germany for the years 1905 and 1906, in which brief notes are given of the condition of the crops throughout these seasons, together with statistics with regard to the area, and the quantity and value of wine produced, the annual production since 1896, and the imports and exports of wine and liquors to and from Germany for the years 1903 to 1905, inclusive.

The area planted with vines in 1905 is given as 120,096 hectares (296,637 acres), from which 3,855,978 hectoliters (101,797,819 gal.) of wine were produced, having a value of 109,176,271 marks ($25,983,952). German wine growing received a severe blow in 1906, owing to the destruction of the crop by various insect and fungus enemies such as the hay and sour worm, Oidium and especially Peronospora, hence the total quantity of wine produced for that year is estimated as only about 1,800,000 hectoliters (47,520,000 gal.). It is rather generally believed among the growers that, although the introduction of American vines might be favorable as regards quantity of wine, the quality would be injured.

Peppermint; a crop for swamp lands (*Rural New Yorker, 66* (*1907*), *No. 2988, pp. 373, 374, figs. 4*).—This is an account of the cultivation, harvesting, and distillation of peppermint in Michigan. It is estimated that not more than 8,000 acres of peppermint were grown in the United States during the past season, more than 90 per cent of which was within a radius of 90 miles of the city of Kalamazoo.

Although mint can be grown on any land suitable for the profitable production of corn, its cultivation is said to be most profitable when grown on soils rich in decayed vegetable matter, commonly known as muck. The estimated average yield of oil per acre, under careful cultivation, is given as 35 lbs. from new mint, about 25 lbs. the second year, and 12 lbs. the third year, or an average of 24 lbs. during a 3-year period. At $2.12 per pound, the average price of mint for the past 10 years, the income per acre is $51.28. Reference is made to one grower who, not long ago, drew to market a year's product of oil on a single load, receiving over $7,000 for it.

Figures are given illustrating the equipment of a mint distillery.

Perfumes: Their source and extraction, J. C. Umney (*Jour. Roy. Hort. Soc. [London], 32 (1907), pp. 123-140, figs. 8*).—Consideration is given to the early history and introduction of the perfume industry into Europe, the classification of flowers for perfumery, and the elaboration of perfumes in plants, together with the processes of extraction and distillation.

Descriptions are also given of numerous odorous synthetic bodies used in making artificial perfumes, together with tabulated data showing the world's production of perfumery of various kinds.

The book of water gardening, P. Bisset (*New York, 1907, pp. 199, pls. 2, figs. 120, dgms. 17*).—This book is designed to give detailed practical information for the selection, grouping, and successful cultivation of aquatic and other plants used in making water gardens and their surroundings. The work is said to contain a record of the author's practical experience with this class of plants extending over a period of 15 years, and covers all conditions from that of the amateur with a few plants to the large estate or park. The text is fully illustrated with numerous plates and diagrams.

FORESTRY.

The trees of Great Britain and Ireland, H. J. Elwes and A. Henry (*Edinburgh, 1907, vol. 2, pp. VI+450, pls. 68*).—This is volume 2 of an extensive treatise on the trees either native to or cultivated in Great Britain, and believed to be suitable for timber trees, including about 300 species in all. In volume 1 the several species of 12 genera were considered (E. S. R., 18, p. 1134).

In part 1 of the present volume the species of 11 more genera are studied: Thujopsis, Æsculus, Tsuga, Juglans, the several varieties of common oak (*Quercus pedunculata*), Larix, Pinus, Gymnocladus, Cedrela, Pterocarya, and Cladrastis. The various species are identified and an account is given of the history and distribution of each in different countries, together with their cultural requirements, uses of the timber, and descriptions of specimen trees growing in Great Britain. Part 2 consists of illustrations and botanical drawings of the various species discussed.

Our trees, H. Correvon (*Nos Arbres. Paris: Librairie Horticole, Geneva [1906], pp. VI+305, pl. 1, figs. 60*).—In this popular work an account is given of the historic trees and forests of Switzerland, together with an outline of reafforestation work under way in various countries and brief descriptions and notes on the economic value of the timber of all the species of trees considered hardy for the climate of Switzerland. The work is intended to create an interest among the mountaineers in the planting of foreign trees resistant to that climate. The text is well illustrated and references are made to numerous articles on forestry bearing on Switzerland conditions.

The forests of the northern coast of Albania, A. Baldacci (*Bol. Uffic. Min. Agr. Indus. e Com. [Rome], 4 (1907), No. 6, pp. 755-769*).—A report on the forests of this region, including a description of the forest areas, the constitution of the forests, the quality and quantity of the different kinds of timber with regard to their economic importance, transportation facilities, and forest regulations, and notes on the cost of exploitation.

How to grow young trees for forest planting, E. A. Sterling (*Ann. Rpt. Ind. Bd. Forestry, 6 (1906), pp. 63-75, fig. 1*).—In this article suggestions are given for the collection, preparation, and care of seeds of conifers and broadleaf trees, together with propagation and nursery practices.

The cultivation of the manna tree (*Rev. Sci. [Paris], 5. ser., 7 (1907), No. 10, pp. 313, 314*).—This is a brief account of the cultivation of the manna tree (*Fraxinus ornus*) in Italy, which originally appeared in a bulletin of the French chamber of commerce in Milan. This tree is said to flourish on dry and rocky soils where other forest trees grow with difficulty, and to be useful in the reafforestation of dry slopes and calcareous sandy soils.

The extraction of the manna commences about the tenth year and continues for the next 10 or 15 years, when the tree is cut back and allowed to grow for 6 or 7 years, after which the manna is extracted for the next 10 or 15 years. This operation is repeated until the tree is from 80 to 100 years old, when the tree is no longer tapped. The manna is extracted by means of horizontal incisions in the trunk, and upon coming to the air solidifies and adheres to the tree. It is sold in the crude state for from 1 to 4 francs per kilogram, depending upon the quality. Manna is sold principally in the form of mannite, of which about 37 parts per 100 is derived under crude processes from the manna at a cost of about 337 francs per hundred kilograms, the product selling for 700 francs per hundred kilograms.

Forest planting in Connecticut, 1907, A. F. HAWES (*Forestry and Irrig., 13 (1907), No. 9, pp. 493, 494*).—Summarized data are given of the forest planting operations in Connecticut in the spring of 1907. As a result of the offer of the State to sell stock at cost, plantings were made by a large number of private owners. In all, 350,000 seedlings were planted by the State, private owners, and corporations in the spring of 1907 as compared with 100,000 seedlings in the spring of 1906.

Report of work accomplished at the reservation and experiment station to December 1, 1905 (*Ann. Rpt. Ind. Bd. Forestry, 6 (1906), pp. 17-32, figs. 8*).—This is an account of the various features of equipment and recent improvements at the State forest reservation and experimental station at Henryville, Ind., together with a discussion of the sylvicultural investigations under way.

The one thing most sought by the board is the demonstration of growing the known valuable commercial forest trees natural to Indiana. The experiments being conducted in natural reafforestation have thus far been very satisfactory.

Forest planting in Indiana, B. W. DOUGLASS (*Ann. Rpt. Ind. Bd. Forestry, 6 (1906), pp. 85-122, figs. 29*).—Information is here given relative to recent forest plantings in Indiana, together with such conclusions and suggestions as are deemed advisable to secure the best results from forest plantings in the future. The article is well illustrated.

Forest planting in eastern Nebraska, F. G. MILLER (*Bul. Nebr. State Hort. Soc., No. 12, pp. 32*).—This bulletin has been previously published as a circular of the Forest Service of this Department and has been noted (E. S. R., 18, p. 640).

Forest laws [Massachusetts], F. W. RANE (*Boston, 1907, pp. X+39, figs. 3*).—For the purpose of acquainting the public with the forest laws of Massachusetts, the author presents the various enactments in booklet form. The laws given pertain to the official powers, duties, etc., of the State forester and forest wardens, punishable offenses and damages for injuring forest lands, the liability, powers, and duties of railroads, town appropriations, public domain plantations exempt from taxation, and the gipsy moth and insect pests.

Those laws relative to trees in the highways, streets, parks, and forests that border the public thoroughfares are designated as "tree warden acts," and are not here discussed.

Prolonging the life of mine timbers, J. M. NELSON (*U. S. Dept. Agr., Forest Serv. Circ. 111, pp. 22, figs. 8*).—In this circular the results are given of a series of experiments conducted in 1906 by the Forest Service in cooperation with the Philadelphia and Reading Coal and Iron Company to determine the best methods for prolonging the life of mine timber.

Decay is found to cause 45 per cent of the destruction, crush or squeeze 35 per cent, and insects and waste 10 per cent each. The chief object of the experimental work was to determine the benefits to be derived by peeling, seasoning or drying out, and by treating with a wood preservative, as well as to determine the comparative value of different kinds of wood for gangway timber. Pennsylvania pitch pine (*Pinus rigida*) and Southern loblolly pine (*P. tæda*) were the principal species tested, together with red oak (*Quercus rubra*) and chestnut (*Castanea dentata*) which are regarded as species suitable for planting in the anthracite region of Pennsylvania.

Sets of round gangway timber, averaging 13 in. in diameter, were used in the experiment. The timber was treated with a variety of preservatives under the brush, open tank, and cylinder methods of application. A summarized statement is given of the various sets of timber.

The results thus far appear to show that it will pay mining companies to peel their round timber, to season it for a few months, and treat it thoroughly with some good preservative. Pitch pine and loblolly pine were treated both efficiently and economically with creosote by the open tank process. Timbers treated with creosote by the cylinder process are also standing well, but the open tank method is said to be far less expensive and to give universally better results. Timbers treated with creosote and carbolineum by the brush method have resisted decay, and it is believed that this method owing to its simplicity may prove advantageous for small consumers, or in cases where the timber is in great danger of being broken by excessive crushes.

An outline is given of a timber policy for the successful preservative treatment of mine timber, together with a diagram of a small commercial plant for treating mine timbers, cross-ties, cross arms, etc.

The preservation of timber (*Sci. Amer. Sup., 64 (1907), No. 1648, pp. 71, 72*).—This article, taken from the *Builder*, contains an account of investigations on the preservation of timber being conducted by H. Deveaux and H. Bouygues for the Administration of the State Railways of France. Although the investigation is still under way, tabular data are here given and discussed in regard to the penetration of heat into timber and the weight of water actually absorbed by some of the cylinders during the process of treatment. From the data secured it is concluded that the time required for the penetration of heat into a cylinder may be taken without serious error as being inversely proportional to the square of the diameter.

The life and preservation of pitch-pine fence posts, B. C. BUFFUM (*Wyoming Sta. Bul. 75, pp. 18, figs. 7*).—This bulletin contains an account of an experiment inaugurated at the station in 1891 to determine the best means of preserving fence posts, together with the results noted after a period of 16 years had elapsed. Eighty posts were included in the experiment, which was divided into 16 lots of 5 each. These were treated with tar and crude oil or petroleum in various ways, and in some cases the posts were simply charred. Check plats of both good and poor posts were left untreated.

According to the author, the best treatment and one which proved highly successful consisted in dipping the lower ends of the posts in crude petroleum and burning off the oil a sufficient distance to come above the ground when set. "The 16 years had made but slight inroads on the posts thus treated and they apparently would last indefinitely."

Fairly good results were secured by simply dipping the lower 2½ ft. of the posts either in crude oil or in tar, with the preference in favor of the oil. Well charred posts ranked third. It is stated that under the conditions untreated good pitch pine posts should last from 12 to 25 years after being set in the ground. The use of bands of either oil or tar applied to the post where it comes through the ground, while helping to preserve the post, is believed to be more expensive than dipping the entire lower end.

The text is accompanied with a series of figures illustrating the results secured.

Exports and imports of forest products, 1906, R. S. KELLOGG (*U. S. Dept. Agr., Forest Serv. Circ. 110, pp. 28*).—This circular consists of a series of 25 tables taken chiefly from a report of the Bureau of Statistics of the Department of Commerce and Labor upon the Foreign Commerce and Navigation of the United States for the year ending June 30, 1906. The information here given includes summaries and detailed data relative to the exports and imports of forest products, including both raw and manufactured material of various kinds.

The total value of the exports of forest products and manufactured materials increased from $70,906,994 in 1903 to $89,602,637 in 1906, while during this time the corresponding imports increased in value from $74,578,674 to $100,065,394. Of the imports the most important item showing an increase is india rubber, of which 55,010,571 lbs., worth $30,436,710, was imported in 1903 as compared with 57,844,345 lbs., valued at $45,114,450, in 1906. This was an increase in value per pound of from 55.3 cts. to 78 cts.

DISEASES OF PLANTS.

Notes on some plant diseases, A. W. BARTLETT (*Rpt. Bot. Gard. Brit. Guiana, 1906–7, pp. 20–22*).—Among the diseases described is a root disease of mango, in which the roots of the mango tree were attacked by a fungus which produced felted mycelium between the wood and the bark. The wood in the affected places had become black as though charred, but as the fruiting state of the fungus has not been observed it could not be identified. The same disease is said to have been observed on roots of mango trees in Grenada and Dominica. The cutting and burning of the trees and isolation by trenching of the places occupied by them are recommended as measures to prevent the spread of the disease.

Brief accounts are given of anthracnose of cotton, an undescribed boll disease, and cotton rust due to *Uredo gossypii*. The type of anthracnose observed in Dominica resembles more closely that occurring in the United States than the variety reported as prevalent in the West Indian Islands. The disease which the author calls boll rot has proved quite destructive, particularly to varieties of Caravonica and Sea Island, as it completely destroys the contents of the bolls. The cotton rust was found abundant, but it apparently caused little injury to the plant.

A root disease of Liberian coffee is reported, but an examination failed to reveal the presence of fungus or insect in the parts above ground, while the roots were blackened and decayed. From examinations it is believed that the fungus is a form of Basidiomycetes. The early indications of the presence of the disease are shown by the leaves turning yellow, afterwards dropping off, and the berries becoming dried and shriveled, followed in a short time by the death of the tree. The disease seems to spread from tree to tree, but by deeply trenching about the diseased trees its spread has been successfully checked.

Notes on the parasitism of Botrytis, F. T. BROOKS (*Proc. Cambridge Phil. Soc., 14 (1907), No. 3, p. 298*).—In an abstract of a paper presented by the author it is stated that the conidia of Botrytis are unable to infect healthy green leaves, whereas if a young mycelium that has been nourished saprophytically is placed upon a normal leaf of such a plant as lettuce, infection spreads rapidly.

Experiments were undertaken to ascertain whether conidia could cause the infection of plants weakened in various ways. Lettuce plants were grown in sterilized sand which was watered from time to time with different mineral solutions. One group of plants received a complete fertilizer, and others solutions containing respectively no nitrogen, phosphorus, potassium, and magnesium. The plants of these groups after growing six weeks were subjected to conidia of Botrytis without infection.

It was found that by tearing the healthy green leaves of lettuce plants infection was readily caused when spores were placed upon the torn portions. The conidia were also found able to infect leaves that were beginning to turn yellow, whether the yellowing occurred in ordinary light or when the plants were placed in darkness.

Cotton wilt, H. R. Fulton (*Louisiana Stas. Bul. 96, pp. 15, pls. 3*).—A general summary is given of information relating to the wilt, blackheart, or black root of cotton, caused by the fungus *Neocosmospora vasinfecta*. Especial attention is called to the use of resistant strains of cotton in combating this disease and suggestions are given for their breeding.

Prevention of sorghum and Kafir corn smut, H. F. Roberts and G. F. Freeman (*Kansas Sta. Bul. 149, pp. 11-15, dgm. 1*).—During the summer of 1906 a series of experiments were carried on at the station to determine means for the control of the grain smut of sorghum and Kafir corn due to *Cintractia sorghi-vulgaris*. These experiments consisted of tests of different strengths of formaldehyde, and it appears that the spores of the fungus can be destroyed by soaking the seed for 12 hours in a 0.2 per cent formaldehyde solution, or for 2 hours in a 0.5 per cent solution. The cost of the treatment is estimated at about 6 cts. per bushel of seed treated.

The present state of our knowledge regarding potato diseases and their control, O. Appel and W. Kreitz (*Mitt. K. Biol. Anst. Land u. Forstw., 1907, No. 5, pp. 31, figs. 18; abs. in Deut. Landw. Presse, 34 (1907), No. 84, pp. 664, 665*).—Compiled notes are given describing the more important diseases of the potato, the time of their appearance, conditions for the development of the diseases, and means for their prevention.

A bacterial disease of potatoes, O. Appel (*K. Biol. Anst. Land u. Forstw. Flugbl. 36, pp. 4, figs. 2*).—A bacterial disease of potatoes is described, the most striking characteristic of which is a darkened zone within the tubers that corresponds in the beginning with the fibrovascular layer of the tuber, from which is derived the name ring disease. Later the infection spreads and other portions of the tuber become involved. The above-ground portions of the infected plants are stunted in growth, the flowers greatly reduced in size, the lower leaves die, and the whole appearance of the plant is changed.

According to the author, the disease does not seem to be caused by a single species of bacteria but by a number of closely related forms that are common in the soil. The abundance of these bacteria depends upon weather and moisture conditions, and they appear to readily gain entrance to the plant through freshly cut surfaces of tubers or accidental injuries to the growing plants. All tubers showing dark rings should be rejected and the cut tubers should be allowed to dry for a day or two before planting.

Some apple diseases, F. L. Stevens and J. G. Hall (*North Carolina Sta. Bul. 196, pp. 39-55, figs. 5*).—Notes are given on a number of diseases of the apple, of which the Volutella rot has been previously described (E. S. R., 19, p. 49). The present account gives in detail some of the characters of this fungus. It is believed that thorough spraying would control the disease.

A description is given of a fruit rot and a disease of apple twigs due to *Coniothyrium* sp. This fungus, which appears to be similar to, if not identical with, *C. fuckelii*, produces a brownish rot of the fruit and a condition somewhat resembling fire blight upon the twigs. Spraying, together with pruning and burning of the diseased material, it is believed, will serve to control the fungus both on the fruit and branches.

A brief account is given of the occurrence of Sphæropsis on apple twigs, and attention is called to the similarity between twigs affected by this fungus and those attacked by Coniothyrium.

The bulletin concludes with an account of investigations on apple scurf, which is probably due to *Phyllosticta prunicola*. The disease is briefly described and the results of several hundred inoculations seem to indicate that it is due to the fungus, which gains entrance ordinarily through injured bark. Only about 3 per cent of the infections took place where the bark was uninjured, and it is believed that in these cases the entrance was made through the lenticels of the bark. Close pruning and spraying would probably control this disease.

Apple leaf spots, E. S. SALMON (*Gard. Chron., 3. ser., 42* (*1907*), *No. 1088, pp. 305, 306, figs. 5*).—Descriptions are given of two leaf-spot diseases observed by the author during the past season, one due to a species of Phyllosticta and the other to a species of Sphæropsis. These fungi have been found on a number of varieties of apples, being especially prevalent on a few varieties.

In several cases in which trees were sprayed for apple scab, there was an entire absence of the leaf spot, and from this the author concludes that both these diseases may be prevented by thorough spraying with Bordeaux mixture.

Gooseberry cluster-cup disease (*Jour. Bd. Agr.* [*London*], *14* (*1907*), *No. 7, pp. 428, 429, fig. 1*).—The cluster-cup of gooseberry, caused by the fungus *Puccinia pringsheimiana*, is briefly described, and attention is called to its sporadic occurrence.

Where the disease assumes the proportion of an epidemic, it is recommended that the infested leaves and fruit be collected and burned. As the fungus spends a part of its life cycle on sedges, wherever these plants are found growing about gooseberry bushes they should be cut early in the spring before the rust matures upon their leaves.

A new gooseberry disease, A. L. SMITH (*Gard. Chron., 3. ser., 42* (*1907*), *No. 1090, p. 341, fig. 1*).—A disease of gooseberries is described in which the leaves fall prematurely. An examination of the branches showed that they were dotted all over with the fruiting bodies of the fungus *Coniothyrium vagabundum*. No investigations have been undertaken for the control of this disease, but it is believed that early and vigorous pruning and the burning of the diseased branches would hold it in check.

Cranberry diseases, C. L. SHEAR (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 110, pp. 64, pls. 7*).—This bulletin gives descriptions of the various fungi that have been observed attacking the cranberry plant in all its parts. There are said to be 4 serious fungus diseases, the scald, caused by *Guignardia vaccinii;* rot, caused by *Acanthorhynchus vaccinii;* anthracnose, due to *Glomerella rufomaculans vaccinii;* and hypertrophy, caused by *Exobasidium oxycocci*. The first 3 diseases have been hitherto confused and often considered as one. Notes have been previously given regarding the technical and cultural characters of these organisms (E. S. R., 18, pp. 54, 648; 19, p. 446).

In addition to these fungi, 13 other species have been found affecting the fruit and 16 species either the stems or leaves, but none of them seem to cause serious injury.

For the control of these diseases, the author recommends the renovation of the cranberry bog, careful attention to water supply, and the cultivation of hardy and disease-resistant varieties. Experiments have shown that Bordeaux mixture is efficient in controlling the disease, particularly if it has added to it a resin-fishoil soap mixture, which makes it cover and adhere to the plants better. Five applications of this fungicide can be made at a cost of $15 to $20 per acre.

Some coffee parasites in St. Thomas, C. Gravier (*Bul. Mus. Nat. Hist. Nat. [Paris], 1907, No. 4, pp. 266–269*).—On the island of St. Thomas, west coast of Africa, the coffee trees are said to be attacked by a number of parasites. Descriptions are given of a beetle, the larvæ of which attack the stems of the coffee tree; some fungus diseases of the leaves, the principal of which is the conidial form of *Torula sphærella*, which causes the sooty mold or fumagine; a root rot of the trees, and attacks of termites.

The principal diseases of forest trees, L. Pechon (*Bul. Soc. Cent. Forest. Belg., 14 (1907), Nos. 6, pp. 324–332; 7, pp. 398–408, pls. 2, figs. 5*).—A rather brief compilation is given describing the principal fungus diseases of coniferous and deciduous forest trees. Suggestions are made for combating these diseases in the seed bed, nursery, and forest.

Sap rot and other diseases of the red gum, H. Von Schrenk (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 114, pp. 37, pls. 8*).—After a brief description of some of the diseases to which the living red-gum tree is subject, an extended account is given of a sap rot of the tree when cut into logs.

This disease, which is caused by *Polyporus adustus*, develops with considerable rapidity, the fungus gaining entrance through the ends of the logs. The fungus was found to completely destroy the sapwood of a large log within a year if the logs were permitted to lie in the woods or along stream banks, as is the usual practice.

Sap rot may be prevented by shortening the drying period in the woods, either by hauling the logs by rail or by reducing the moisture in the log. The reduction of the moisture may be secured to a considerable degree by felling the trees without sawing them into logs and leaving them in the forest until the leaves are thoroughly dry. The sap rot may likewise be almost entirely prevented by coating the ends with hot coal-tar creosote immediately after the logs are cut. This treatment can be made at an expense of about 8 cts. per 1,000 ft. B. M. Wherever possible, all freshly cut logs, particularly those cut during the spring and summer months, should have the bark peeled off.

In addition to the above, sap rots of red gum may be caused by the fungi *Polystictus hirsutus* and *Poria subacida*. A number of other species of fungi attack the sapwood, but they are of minor importance. An attack of the heartwood of the red gum, due to *Lenzites vialis* is briefly described, and in addition *Polyporus lacteus* and an undescribed species of Trametes are said to attack the heartwood.

Heart rot of sassafras caused by Fomes ribis, P. Spaulding (*Science, n. ser., 26 (1907), No. 667, pp. 479, 480*).—A description is given of *Fomes ribis*, which is found attacking the stem of sassafras trees. This fungus occurs quite generally throughout Europe but is not at all common in America. An examination showed that the sporophores were always located at points where the heartwood of the tree had been exposed either by the breaking of the branches or the splitting of the main trunk. The fungus apparently enters the tree trunk in the same manner as most of the so-called wound parasites, and progresses into the heartwood, extending upward, downward, and sidewise, until the tree finally dies or is broken by the wind.

The heartwood of the sassafras is normally of a rather dark brownish color, but when attacked by this fungus it is lighter in color and slightly reddish, due, doubtless, to the presence of the mycelium of the fungus. The rotten wood seems to retain much of its original appearance, yet it is decidedly weakened by the action of the fungus in dissolving the middle lamellæ from between many of the cells.

Effect of formalin and bluestone on the germination of seed wheat, D. McAlpine (*Dept. Agr. So. Aust. Bul. 12, pp. 21*).—Experiments were carried on in which seed wheat was treated with different strengths of a solution of formalin and with copper sulphate to test the effect of these fungicides on the germination of wheat.

When the formalin and copper sulphate treatments were compared the former was found to give a higher percentage of germination.

The best strength of formalin for field use is said to be 1 lb. in 40 gal. of water. This strength may be used for all varieties of wheat, and the higher the normal germination the better will be the results with the formalin.

Wheat treated with formalin of this strength is best if sown while damp, and the germination becomes less and less satisfactory until about a week after treatment when it is at its lowest point. The germination is said to improve again when the wheat is sown about 2 weeks after treatment and to continue to improve, so that on sowing 4 weeks after treatment the germination will be practically as good as at 24 hours. If stronger solutions are used, as a rule the germination becomes poorer the longer the grain is kept before sowing.

The preparation of Bordeaux mixture, G. T. Grignan (*Rev. Hort.* [*Paris*], *79* (*1907*), *No. 20, pp. 470–472*).—A discussion is given of the common methods of preparing and using Bordeaux mixture, and attention is called to the recent investigations of Pickering relative to the composition of that important fungicide (E. S. R., 19, p. 450). The efficiency of more dilute solutions than those commonly recommended is pointed out and attention directed to the facts that Cavazza had recommended the use of dilute Bordeaux mixture as early as 1886 and that such solutions are in common use in Italy. The injury sometimes caused by Bordeaux mixture is also noted, the information being largely drawn from New York State Station Bulletin 287 (E. S. R., 19, p. 50).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report on zoology, E. Blackwelder (*Research in China. Washington, D. C.: Carnegie Institution, 1907, vol. 1, pt. 2, pp. 481–507, pls. 6*).—During three journeys through various parts of China observations were made on the vertebrates and invertebrates along the route. Particular attention was given to Batrachia, reptiles, birds, and mammals. The notes on the species and habits of birds are especially complete.

Birds in relation to the farm, the orchard, the garden, and the forest, C. H. Hooper (*Agr. Students' Gaz., n. ser., 13* (*1907*), *No. 4, pp. 118–125*).—Details are given regarding the feeding habits of more than 50 species of birds which are classified as beneficial or injurious according to their food. Among the beneficial birds the cuckoo, starling, tits, and swallows occupy a prominent place. Grouse, wood pigeons, jays, etc., are mentioned as injurious.

The relation of birds to the cotton boll weevil, A. H. Howell (*U. S. Dept. Agr., Biol. Survey Bul. 29, pp. 31, pl. 1, figs. 6*).—Birds can not be depended upon to control the boll weevil but they assist in keeping it in check. As a result of 5 years' work 43 species of birds have been found to feed on the boll weevil, 23 principally in summer. Suggestions are made regarding State legislation needed to protect certain of these birds.

The most important birds in the control of the boll weevil are swallows, orioles, blackbirds, and meadow larks. Detailed statements are given regarding the extent to which different species of birds feed upon the boll weevil.

Birds of California in relation to the fruit industry, I, F. E. L. Beal (*U. S. Dept. Agr., Biol. Survey Bul. 30, pp. 100, pls. 5*).—A thorough study has been made of the economic status of all the common birds observed in California orchards. In estimating the economic position of these birds much stress has been laid on the nature of the food of each species for the whole year. The depredations of birds in orchards are often due to the failure of the natural food supply. In protecting orchards against fruit-eating birds the author recommends planting mulberries or wild cherries and providing suitable water supply for birds.

Detailed accounts are given of the feeding habits as determined by field observations and examination of stomach contents of the house finch, western tanager, swallows, vireos, wrens, nuthatches, titmice, kinglets, gnatcatchers, robin, shrike, western bluebird, etc. In the case of all species which eat fruit at all it was found that the destruction of injurious insects and weed seeds was sufficient to counterbalance the harm done by the birds. Even the western robin which at times feeds almost exclusively on olives is held to be a beneficial species on the whole.

Bird protection, E. H. Forbush (*Mass. Crop Rpt., 20 (1907), No. 5, pp. 29–40*).—A historical account is presented of the development of game and bird protection in Massachusetts. Special mention is made of legal protection for water fowl, shore birds, upland game birds, pigeons, nongame birds, etc. Needed reforms are prohibition of spring and summer shooting, resident hunting licenses, prohibition of the sale of game birds, and the establishment of bird preserves.

Biological study of parasitic protozoa, G. Lindner (*Arch. Wiss. u. Prakt. Thierheilk., 33 (1907), No. 4–5, pp. 432–444, pl. 1*).—Biological and descriptive notes are given on *Colpidium colpoda*, Miescher's sacs, and Vorticella.

The animal enemies of sugar cane, W. Van Deventer (*Handbœk ten dienste van de Suikerriet-Cultuur en de Rietsuiker-Fabricage op Java. Amsterdam, 1906, pp. XVIII+298, pls. 42, figs. 71*).—This volume contains an elaborate account of the mammals, birds, insects, mites, crustacea, and worms which attack sugar cane. Each pest is described and notes are given on its habits and methods of attack on sugar cane. The report is based on the conditions found in Java, but many of the insect pests have a much wider distribution. The text is well illustrated.

Notes on insect, fungus, and other pests, R. S. MacDougall (*Jour. Bd. Agr. [London], 14 (1907), No. 5, pp. 290–300*).—Arsenate of lead is recommended in combating brown-tail moth. *Cetonia aurata* and *Harpalus ruficornis* are reported as injuring strawberries. A species of Baridius was found boring in the stem of cabbage. Brief notes are also given on cabbage maggot, frit fly, aphides, and sawflies.

Injury from frit fly may be partly avoided by early sowing, liberal application of fertilizers, and the destruction of wild grasses about grain fields in winter.

How to control injurious insects and noxious plant diseases, G. W. Herrick (*Mississippi Sta. Bul. 102, pp. 14, figs. 3*).—Brief directions are given for the preparation and application of Paris green, arsenate of lead, arsenite of lime, carbon bisulphid, lime-sulphur-salt wash, kerosene emulsion, pyrethrum, Bordeaux mixture, formalin, and other insecticides and fungicides for the control of insect pests of crops and animals and the common fungus diseases of plants.

Report of the zoologist, 1906, C. Warburton (*Jour. Roy. Agr. Soc. England, 67 (1906), pp. 267–281, figs. 16*).—*Incurvaria capitella* on currants may be controlled by cutting away badly infested shoots. Pear midge is to be combated by picking off and destroying infested fruit in May. *Glyciphagus spinipes* in tobacco was destroyed by subjection to a temperature of 150° F. for one-half hour.

A general account is given of the relation of ticks to disease. In this discussion the author considers *Dermacentor reticulatus, Ixodes ricinus, Argas reflexus*, cattle ticks, etc.

Evidence of the entomologist and botanist before the select standing committee on agriculture and colonization, 1906–7, J. Fletcher (*Ottawa: Govt., 1907, pp. 113–140*).—A copy is given of a statement made before the Canadian committee on agriculture on the prevalence and means of combating San José scale, apple maggot, cutworms, plum curculio, asparagus beetles, etc. Particular mention is made of fumigation and lime-sulphur wash as applied against San José scale.

Entomological notes, C. W. Howard and L. Peringuey (*Rhodesian Agr. Jour., 4 (1907), No. 5, pp. 471–482*).—The habits and means of controlling fruit flies are briefly outlined. Formulas are given for soap and arsenical solution for use in controlling locusts. Descriptions are presented of *Pachytylus sulcicollis* and *Cyrtocanthacris septemfasciata*. Observations have been made on forest insects particularly borers and leaf-eating lepidoptera.

Inspection work, A. Craw (*Hawaii. Forester and Agr., 4 (1907), No. 6, pp. 176–178, figs 2*).—Potatoes imported from Australia were found to be badly infested with potato moth (*Lita solanella*). Japanese rushes after fumigation appeared to be free from insect pests. A small unidentified beetle was found infesting garlic.

The most important step in the control of the boll weevil, W. D. Hunter (*U. S. Dept. Agr., Bur. Ent. Circ. 95, pp. 8*).—A revision of Circular 56 already noted (E. S. R., 16, p. 576).

The locust plague, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 31 (1907), No. 2, pp. 168–174*).—The chief locust pests of Cape Colony are *Cyrtocanthacris septemfasciata* and *Pachytylus sulcicollis*. A historical statement is given of the occurrence and ravages of these two species. The most vulnerable point in the life history of the locusts is the nymphal stage. A systematic effort is being made to disseminate information regarding the best means of combating the pests. A government appropriation of $50,000 is recommended for carrying on the locust campaign.

Locust destruction (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 6, pp. 609–617*).—At an intercolonial conference in South Africa the problem of locust destruction was discussed. It was recommended that each colony take steps to destroy the locusts in the nymphal stages. A sweetened solution of arsenite of soda is considered the best remedy. The cost of a locust campaign on the part of the colonial governments is believed to be small in comparison with the value of the crops saved.

Destruction of locusts ordinance, 1907 (*Orange River Colony, Dept. Agr. [Pub.], 1907, pp. 24*).—The colonial government issues insecticide material and loans spray pumps to farmers for use in destroying locusts. For killing locusts up to 14 days old, 1 lb. arsenic and 4 lbs. sugar is recommended for each 16 gal. water, for the next 3 weeks the same in 12 gal. water, and for the last 3 weeks the same in 8 gal. water.

Report on trials of the South African locust fungus in India, E. J. Butler and H. M. Lefroy (*Agr. Research Inst. Pusa [India] Bul. 5, 1907, pp. 5*).—Cultures of *Mucor exitiosus* were used in attempts to infect locusts. The fungus failed to make a good growth even when inoculated into wounds of *Acridium æruginosum* and *A. succinctum.* The locusts may eat the spores with impunity. No infection occurs when the locusts are kept in a moist atmosphere and sprayed with spores. During the experiments a few of the locusts died but apparently not as a result of the fungus. Negative results were also obtained in tests with the fungus on *Hieroglyphus furcifer.*

On the life history, habits, and economic relations of the white grubs and May beetles, S. A. FORBES (*Illinois Sta. Bul. 116, pp. 447–480*).—In Illinois 8 species of Lachnosterna are known to be injurious. These are *L. fusca, L. rugosa, L. inversa, L. implicita, L. gibbosa, L. tristis, L. ilicis,* and *L. hirticula.* The length of the life cycle of these species is not definitely known but probably it is from 3 to 4 years according to climatic and other conditions.

The eggs hatch within 10 days to 4 weeks after they are deposited. White grubs which are found in the soil later than the middle of September do not appear as beetles until the following year. Numerous observations were made, the results of which are stated in tabular form, regarding the relative abundance of the different species of Lachnosterna at lights, on trees, and in different localities and years and on different species of trees. Apparently white grubs feed on a considerable variety of plants without showing any great preference except that the poplar is in some instances at least a favorite food. There is no evidence of any migratory movement of May beetles at any stage of development.

According to the author's observations adult beetles seldom fly during nights when the temperature is below 52° F. These insects hibernate in both the larval and adult stages. The grubs are found from 3 in. to 2 ft. below the surface depending upon the prevailing temperature. They are somewhat more abundant in light and dry than in heavy and moist soil and accumulate to the greatest extent in fields allowed to remain for long periods in pasture. The grubs may destroy the turf of lawns, strawberry vines, young evergreens in nurseries, and cause serious damage to grass and corn.

The principal enemies of these pests are pigs, crows, blackbirds, and species of Tiphia and a number of other less important insect parasites. In an experiment carried out by the author 100 pigs and 8 sows were turned into a badly infested field of 10 acres. In a month's time about 90 per cent of the grubs had been destroyed. May beetles may also be destroyed by spraying infested trees with arsenical poisons and by offering bounties for the collection of adult beetles.

On the life history of the root maggot, Anthomyia radicum, C. G. HEWITT (*Jour. Econ. Biol., 2 (1907), No. 2, pp. 56–63, pl. 1*).—In breeding cages the eggs of *Anthomyia radicum* were laid in fresh horse manure. The egg stage covers 18 to 36 hours, the first larval stage 24 hours, the second 48 hours, the third 5 days, and the pupal stage 10 days. In hot weather the life cycle may be completed in a shorter time. The life history of *A. radicum* and *A. brassicæ* is compared.

Asparagus insects, P. LESNE (*Jour. Agr. Prat., n. ser., 14 (1907), No. 36, pp. 308–311, pl. 1*).—Biological and economic notes are given on *Crioceris asparagi, C. 12-punctata, Platyparea pœciloptera, Agromyza simplex, Aphis papaveris,* etc. In controlling asparagus beetles handpicking and the use of lime are recommended.

Insect pests of the artichoke, P. LESNE (*Jour. Agr. Prat., n. ser., 14 (1907), No. 28, pp. 49–52, pl. 1*).—The artichoke is excessively infested with insect pests. The author discusses from biological and economic standpoints a number of these insects including *Tipula oleracea, Trama troglodytes, Gortyna ochracea, Vanessa cardui*, etc.

A new species of Tyroglyphus injurious to onions, A. A. ELENKIN (*Zhur. Bolyezni Rast., 1 (1907), No. 1-2, pp. 52-69, figs. 2*).—Under the name *Tyroglyphus allii* the author describes as new a species of mite which attacks onions but can not be reared on other bulbs or on cheese. The mites feed on the whole interior of the onion bulb. No remedy is suggested.

The sweet-potato borer, A. F. CONRADI (*Texas Sta. Bul. 93, pp. 16, figs. 6*).—*Cylas formicarius* was first reported in Texas in 1890. It has gradually spread northward although the adults are readily destroyed by low temperatures especially if unprotected. The insect is described in its various stages. On the northern limit of the infested area there are four or more broods, while in south Texas there are seven or more broods annually. The insect feeds upon sweet potatoes, common species of morning glory, and to a less extent on other plants.

No evidence was obtained that the sweet-potato weevil ever uses its wings. Its spread is, therefore, slow and gradual. Rotation of crops assists to some extent in controlling the pest provided other measures of eradication are adopted. Deep planted tubers are less infested than shallow planted tubers but no variety has been found to be immune. Some of the weevils, but apparently not all, may be destroyed by fumigation with carbon bisulphid in bins. Storage bins at any rate should be made clean and clean tubers should be separated from infested tubers.

Infested tubers should not be fed raw to stock since the remnants may contain enough larvæ to cause serious infestation of the next crop of sweet potatoes. The adults feed upon the vines to some extent and may be destroyed by spraying with arsenicals.

Codling moth investigations during 1903 and 1904, F. GARCÍA (*New Mexico Sta. Bul. 65, pp. 29, dgms. 3*).—Extensive records kept by the author show that the first brood from the overwintering larvæ and the partial third brood are very small while the second brood is large. The period for each brood is about 50 days. The different broods overlap one another greatly. The weather had little effect upon the time of appearance of the moths. The first brood of moths appears about the same time as the blossoms.

The codling moth in eastern Washington, A. L. MELANDER and E. L. JENNE (*Washington Sta. Bul. 81, pp. 24, figs. 7*).—In previous experiments at the station it was shown that arsenate of lead was the most effective of the arsenicals tried in combating the codling moth and that 4 sprayings were as effective as 12. During the past summer different brands of arsenate of lead have been tested on 125 acres of commercial orchards. The total cost of making 4 applications to 1 orchard of 20 acres was $116. All of the brands of arsenate of lead were found to be quite efficient.

It is recommended that arsenate of lead be applied at the rate of 1 lb. to 40 gal. of water. Four applications are recommended, the first just after the blossoms fall, the second 3 weeks later, the third at some time from July 15 to August 10, and the fourth about a month later. The first application is the most important but the others are also necessary. Thorough cultivation is of much importance and the spraying must be done thoroughly and at times when the poison will be effective in destroying the larvæ.

Report of the commissioner for the suppression of the gipsy and brown-tail moths, 1906, A. E. STENE (*Providence, R. I., 1907, pp. 80, pls. 28, maps 3*).—A general historical account is given of the introduction of the gipsy moth into Massachusetts and its spread to other States. The moth is described and the means of its dissemination outlined. It may be fought by destroying the eggs, using burlap, spraying, applying sticky bands, and general cleaning work.

The work of extermination in Rhode Island has given promising results, and the author recommends that in the future the campaign be one of extermination rather than suppression.

Brief economic and biological notes are also given on brown-tail moth.

The more important Aleyrodidæ infesting economic plants, with description of a new species infesting the orange, A. L. Quaintance (*U. S. Dept. Agr., Bur. Ent. Bul. 12, tech. ser., pt. 5, pp. 89–94, pl. 1, figs. 2*).—Mention is made of the Aleyrodidæ which attack the tobacco, sugar cane, orange, cotton, cocoanut, custard apple, strawberry, cabbage, greenhouse plants, species of Rubus, currant, peach, plum, fig, etc. *Aleyrodes howardi* is described as a new pest of the orange.

The scale insects of fruit trees, J. P. Bounhiol (*École Agr. Algér. Maison-Carrée, Inform. Agr. Bul. 3, pp. 16, pls. 2*).—Notes are given on the life history of species of Lecanium, Aspidiotus, Dactylopius, etc. Formulas are presented for the preparation of petroleum emulsion, soap mixtures, lime and sulphur and for fumigation with hydrocyanic-acid gas.

Number of molts of the female of Dactylopius citri, R. Matheson (*Canad. Ent., 39 (1907), No. 8, pp. 284–287*).—The literature relating to this species is critically reviewed. The author describes in detail the nymphal and adult stages of the insect.

The San José scale and remedies, F. Sherman, Jr. (*Bul. N. C. Dept. Agr., 28 (1907), No. 5, pp. 62, figs. 15*).—The San José scale is described in its various stages and an account is given of its history in North Carolina. A list of food plants is presented in connection with recommendations of remedies. The suggested remedies include lime-sulphur wash and a proprietary insecticide. It is believed that a combination of these may be used to advantage.

The San José scale in North Carolina, F. Sherman, Jr. (*Bul. N. C. Dept. Agr., 28 (1907), No. 6, pp. 18, figs. 2*).—A detailed statement is given of the present distribution of the San José scale in every county of North Carolina where it occurs.

The fruit maggot fly pests, G. Quinn (*Jour. Dept. Agr. So. Aust., 10 (1907), No. 11, pp. 701–710, figs. 14*).—Mention is made of the habits of *Tephritis tryoni*, *T. psidii*, *Trypeta ludens*, *T. pomonella*, *Dacus oleæ*, *Ceratitis capitata*, etc. The remedies thus far devised for these pests are not very satisfactory. A poisoned bait used in Italy has given fairly good results. Kerosene appears to exercise an attraction for the fruit flies and may, therefore, be used to trap them.

The fruit fly, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 31 (1907), No. 2, pp. 186, 187*).—In 1906, *Ceratitis capitata* was more injurious than ever before. The pest may be controlled by spraying the trees with a preparation of arsenate of lead (1 lb. per 25 gal. water and 2 gal. of molasses). The maggots of the fruit fly are destroyed by cold storage. Infested peaches stored for 3 weeks at a temperature of 38 to 40° F. were found to contain no live maggots.

Combating the olive fly, P. Marchal (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 8, pp. 927–931*).—Two general methods have been proposed for controlling *Dacus oleæ*. These are spraying with a mixture of molasses, honey, glycerin, and arsenate of soda, and improved cultural operations. The harvest should be completed in April, and olives should not be planted alone in orchards but rather with almonds, figs, and other trees. Unimproved olive trees should be destroyed or grafted and cared for.

Experiments in the treatment of grape vines for phylloxera, P. C. Mestre (*Rev. Agr., Vit. et Hort., 1907, Nos. 77, pp. 169–172; 78, pp. 178–182; 80, pp.*

213–219; 81, pp. 230–235, figs. 6).—The symptoms of infestation with phylloxera are described and notes are given on the damage caused by this pest. Infested vines may subsequently be attacked by fungi and *Cocpophagus echinopus*. In the direct control of phylloxera the author tested the insecticide recommended by Degenne and Deroin. It gave excellent results in all cases.

Combating Eudemis botrana, J. Capus and Feytead (*Prog. Agr. et Vit.* (*Ed. l'Est*), *28* (*1907*), *No. 40, pp. 409–414*).—Arsenicals and other insecticides should be applied when the larvæ are small. Arsenate of lead is very efficacious. Tobacco decoction and whitewash were less satisfactory. Scraping the bark in winter and spraying with Bordeaux mixture in spring gave good results.

Two unusual grape pests, V. Mayet (*Prog. Agr. et Vit.* (*Ed. l'Est*), *28* (*1907*), *No. 40, pp. 400–403, pl. 1*).—*Psyche graminella* and *Agelastica alni* are reported as attacking grape leaves. Notes are given on the habits and life history of these pests.

Insects injurious to roses, A. L. Clement (*Jour. Soc. Nat. Hort. France, 4 ser., 8* (*1907*), *pp. 160–165*).—Biological notes are presented on *Melolontha vulgaris*, earwigs, *Athalia rosarum*, *Paronia minor*, *Typhlocyba rosæ*, etc. For controlling the last-named insect a mixture of soap and pyrethrum powder is effective.

A method of destroying the larvæ of insects in tree plantations, M. Eberhardt (*Agr. Prat. Pays Chauds*, *7* (*1907*), *No. 51, pp. 531–533*).—In Indo-China the larvæ of longhorn beetles cause great damage to tea, mulberry, and orange trees. The branches or the trunk may be attacked. When the branches are infested with the boring larvæ the author recommends injections of a mixture containing 110 parts formalin and 40 parts glycerin in 850 parts water, and for the trunk a mixture containing 180 parts formalin and 60 parts glycerin in 760 parts water. The mixtures are to be introduced into the galleries of the insects by means of a syringe.

A remedy for the spruce gall and larch blight diseases caused by Chermes, E. R. Burdon (*Jour. Econ. Biol.*, *2* (*1907*), *No. 2, pp. 64–67*).—As a result of continued experiments it is stated that spruce and other conifers may be entirely freed from Chermes by spraying in winter with kerosene emulsion. At this season this treatment does not injure the trees, as the leaves are mature and withstand the insecticide, and the buds are protected by thick resinous scales. Two formulas gave good results. The first contained 3 lbs. soap and 1 pint kerosene in 2 qts. water and was diluted before using by adding 5 gal. of water. The other insecticide carried 1 lb. soft soap in each gallon of water.

Parthenogenesis in Lophyrus pini, R. S. Macdougall (*Jour. Econ. Biol.*, *2* (*1907*), *No. 2, pp. 49–55, pl. 1*).—This sawfly lays its eggs chiefly on Scotch pine and Austrian pine. The caterpillars eat the leaves and dwarf shoots. There are 2 generations annually. In experiments in breeding cages it was found that unfertilized eggs invariably produced male insects.

A recently introduced borer-beetle, T. F. Dreyer (*Agr. Jour. Cape Good Hope*, *31* (*1907*), *No. 2, pp. 140, 141, figs. 5*).—*Phoracantha recurva*, a native of Western Australia, has been reported in Cape Colony as injurious to eucalyptus. Brief descriptive and economic notes are given regarding the pest.

Fumigation with hydrocyanic-acid gas for bedbugs, G. W. Herrick (*Canad. Ent.*, *39* (*1907*), *No. 10, pp. 341–345*).—Fumigation has been successfully used in a large dormitory. It has been found that 2 men can set off the charges in 50 rooms in 15 minutes. The fumes killed bedbugs protected by 3 in. of excelsior, 2 in. of cotton, thick woolen blankets, etc. Eggs also seemed to be destroyed effectively. The method is recommended as safe and reliable. The cyanid was used at the rate of 1 oz. per 90 cu. ft. of space.

The blood-sucking diptera, K. GRÜNBERG (*Die Blutsaugenden Dipteren. Jena, 1907, pp. VI+188, figs. 127*).—An attempt is made to give in convenient form information concerning the appearance and economic importance of all groups of blood-sucking diptera with particular reference to the German colonies. Several of the groups of diptera discussed are known to be agents in the transmission of diseases. Other groups may be so concerned and should receive more attention with this idea in mind. The insects studied by the author include Psychodidæ, Culicidæ, Chironomidæ, Simuliidæ, Tabanidæ, and various other families.

A type of Simulium reptans in the equatorial Congo, E. ROUBAUD (*Ann. Inst. Pasteur, 21 (1907), No. 8, pp. 670, 671*).—This European species of Simulium is reported to be widely distributed in equatorial Congo. It lives among vegetation but attacks cattle, antelopes, and elephants for the purpose of sucking their blood.

Insect collection, H. A. SURFACE (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 5, pp. 131–166, pls. 2, figs. 30*).—A popular account of the methods of collecting and preserving insects as specimens and for study.

Analyses of Paris green, C. S. CATHCART (*New Jersey Stas. Bul. 205, pp. 9*).—The advertised weight of packages of Paris green obtained in the open market appear to include the weight of the Paris green and that of the container. At any rate the Paris green in such packages amounted to 6.98 per cent less by weight than was claimed by the manufacturers. In 29 samples analyzed by the author the average content of arsenious oxid was 57.31 per cent, that of water soluble arsenic 1.98 per cent, and that of copper oxid 29.73 per cent. Twenty-three of the samples are considered to be of high grade.

FOODS—HUMAN NUTRITION.

The tuna as a food for man, R. F. HARE and D. GRIFFITHS (*New Mexico Sta. Bul. 64, pp. 88, pls. 7, figs. 2*).—Cactus fruit, particularly tuna or the fruit of the prickly pear (Opuntia) is an important food stuff in Mexico and used to a less extent in the southwestern United States. The authors describe the structure and appearance of the fruits, methods of harvesting, keeping qualities, dried tunas, and tuna products. These products and a number of samples of fresh tuna fruits, the majority of them from Mexico, were analyzed, as well as a sample of the fruit of another variety of cactus (*Echinocereus stramineus*) or Mexican strawberry.

The average weight of the Texas-grown tuna was 35.43 gm. and of the Mexican samples 71.17 gm. In the Texas samples the edible portion was 28.44 per cent of the total and contained 6.74 per cent total solids, 0.356 per cent total protein of which 0.143 per cent was amid nitrogen, 2.94 per cent total sugar as dextrose, and 0.30 per cent ash in soluble solids. In the case of the Mexican samples the edible portion constituted 42.26 per cent of the total fruit and contained 11.84 per cent total solids, 0.377 per cent total protein of which 0.276 per cent was amids, 9.53 per cent total sugar as dextrose, and 0.36 per cent ash in soluble solids. The character of the sugar and ash constituents and of other chemical constituents was also studied. In general, analysis "of the whole fruit as well as rind and pulp shows the amount of acid to be exceeedingly variable in the different varieties of this fruit. In fact, it was found to be variable for different samples of the same variety, depending, no doubt, upon the degree of ripeness of the fruit. . . .

"The percentage of sugar varied a great deal for the different varieties, and, as was to be expected, it varied at times for the same variety, depending, no doubt, upon the season and degree of ripeness.

"The iodin test on the ripe fruits failed to reveal the presence of starch in any of them. . . .

"The average soluble ash in the pulp is 0.29 per cent, which is about the same amount found in apples, pears, or watermelons, and less than is found in the citrus fruits. As with other plants the seed of this fruit is also quite low in ash, it being in . . . [one sample], for example, only 0.28 per cent of the whole fruit, which is about the same as is found in the fresh pulp.

"The character of the ash is decidedly alkaline. . . . The alkalinity of the ash of the pulp calculated to potassium carbonate amounts to 55 per cent of the total ash. The alkalinity of the ash of the rind calculated in a similar manner amounts to 41.18 per cent, while for the whole fruit 48 per cent of the ash is potassium carbonate.

"Very little can be said in regard to the plant food removed from the soil by the tunas until we can determine what the yield per acre will be. The amount of total ash removed by the fruits is very small compared to the amount removed by the stems. . . . Most of this ash was found to be composed of lime and potash salts which are in abundance in most semiarid soils, and if so large an amount of these salts is necessary for securing the best results with this plant, it will probably never suffer for the lack of them anywhere in the Southwest.

"The ash is also characterized by a very low content of phosphoric acid. An analysis of the ash from 28 samples of cactus averaged only 1.39 per cent (PO_4), while other plants seldom have less than 4 per cent."

Tunas and tuna products are eaten in large quantities. Some varieties are of better quality than others but the products as a whole seem to be wholesome and palatable. The honey-like sirups and thick marmalade-like preserves made from tunas vary in color and appearance according to the method of manufacture. The juice and the pulp of the red tuna are highly colored and some tests were made of the possibility of using this material for coloring other food products. When some of the fruit pulp was evaporated to a thin paste "it was used for coloring apple jelly and candy and was found to serve admirably for the former purpose." In the case of candy the color lacked brilliancy.

The waste material obtained in the manufacture of tuna preserves, etc., has some value as a cattle feed. Botanical descriptions are given of the different sorts of tunas and the Echinocereus.

The tuna as food for man, D. Griffiths and R. F. Hare (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 116, pp. 73, pls. 6*).—This bulletin reports essentially the same data as are included in the publication noted on page 558.

Meat supply and surplus, with consideration of consumption and exports, G. K. Holmes (*U. S. Dept. Agr., Bur Statis. Bul. 55, pp. 100*).—A large amount of statistical and other data are summarized and discussed regarding the production of meat, the export and import trade in meat and meat products, and the total number of meat animals, as well as various questions of meat production and consumption in the United States and elsewhere.

According to the author, the average meat consumption per capita in the United States in 1900 was 1.099 meat animal, this value being made up as follows: 0.546 pig, 0.077 calf under 1 year, 0.153 bovine animal over 1 year of age, 0.168 lamb under 1 year, and 0.155 sheep over 1 year. The author's computed annual consumption of meat per capita is 182.6 lbs. or 840 lbs. of edible meat per family. The conclusion is reached that the consumption of meat in the United States has decreased, particularly since 1880 and 1890.

Statistics are summarized regarding the expenditures for meat and regarding the amounts of other foods equivalent to a given quantity of meat on the basis of protein and energy, and regarding the relative cost in Washington in 1906 of meat and a number of other sorts of food.

The bulletin as a whole constitutes an exhaustive summary and discussion from a statisitcal standpoint of the production and utilization of meat and meat products as food.

Studies of the effect of different methods of cooking upon the thoroughness and ease of digestion of meat at the University of Illinois, H. S. GRINDLEY, T. MOJONNIER, and H. C. PORTER (*U. S. Dept. Agr., Office Expt. Stas. Bul. 193, pp. 100*).—The results of 67 natural and 99 artificial digestion experiments with meat undertaken to determine the ease and thoroughness of digestion of different kinds and cuts of meat cooked in a variety of ways are reported in continuation of earlier work (E. S. R., 17, p. 886).

The average digestibility of the whole ration when beef round cooked in different ways was eaten with several other common food materials was protein 93 per cent, fat 98 per cent, and carbohydrates 97 per cent. "These coefficients agree very closely with those found in the average of several hundred digestion experiments with varied diet. In these experiments differences in method of cooking the meat had no appreciable effect upon the proportions of nutrients digested and absorbed from the total diet."

In 44 experiments with beef, veal, mutton, and pork, cooked in various ways and eaten as a part of a simple mixed diet, the average digestibility of both the protein and fat of the meat alone was 98 per cent.

"Differences in the results obtained with different kinds of meat or with the same kind of meat cooked in different ways were too small to be of any practical significance.

"The relative fatness of the meat had no appreciable effect upon the thoroughness of digestion, the nutrients of very fat meat being digested as completely as those of very lean meat, including that from which in some cases part of the visible fat had been removed before cooking.

"In short, all the kinds and cuts of meat were very thoroughly digested, whatever the method of cooking. . . .

"It is commonly said that meats of different sorts vary decidedly in digestibility; for instance, that red meat is less digestible than white meat or beef than pork, or that a cheap cut is less digestible than a tender steak. As regards the thoroughness of digestion the results of the extended series of tests reported show that such differences do not exist in any appreciable degree, and that meat of all kinds and cuts is to be classed with the very digestible foods.

"Ninety-nine artificial digestion experiments made for the purpose of testing the relative ease of digestion of different kinds and cuts of meat cooked in different ways do not warrant any sweeping deductions. So far as can be judged from the results obtained under the experimental conditions the meat seems to be quite easily digested. About 80 per cent of the meat protein was digested in the first hour and nearly 90 per cent within 2 hours, whatever the kind of meat or the method of cooking, though there were considerable variations from these proportions in the individual experiments. The differences with the several kinds of meat or with meat cooked in a variety of ways are very small or very irregular, and in some cases are apparently contradictory, so it can not be said that they indicate any difference that could be attributed to the factors mentioned."

Experiments with dogs on the metabolism of energy and matter on different diets, W. FALTA, F. GROTE, and R. STAEHELIN (*Beitr. Chem. Physiol. u. Path., 9 (1907), No. 8-11, pp. 333-385*).—In the investigations reported a modified Jaquet respiration apparatus was used (E. S. R., 16, p. 287) and the specific dynamic effect of different proteids, the proportion of energy derived from protein, fat, and carbohydrates, the possibility of replacing protein with carbohydrates, and related questions were studied. The foods used in the tests were meat, casein, gluten casein, hydrolyzed casein, and meat with levulose. The authors state that if any difference in the specific dynamic power of the foods existed it was very small and unimportant and that the physiological nutritive effect of hydrolyzed casein is not lower than that of meat protein.

In the experiments reported the specific dynamic effect of the food upon heat production was much less than was to be expected from earlier metabolism experiments and considerably smaller than that which would correspond to the cleavage of protein alone.

A comparison of the carbon dioxid curve and the values for the respiratory quotients with the nitrogen curve in the experiments showed that nitrogen excretion was greatly increased at the time when the respiratory gaseous exchange had nearly or quite reached the value noted in fasting.

Nitrogen compounds in the urine as affected by differences in diet, B. Schöndorff (*Arch. Physiol. [Pflüger]. 117 (1907), No. 5-6, pp. 257-274*).—Experiments with dogs fasting and fed with meat, rice, and lard, alone and in combination showed, according to the author, that increasing the nitrogen content of the food may increase the urea nitrogen to a maximum value of 97.98 per cent of the total nitrogen excreted in the urine. When fasting this value may diminish to a minimum of 75.44 per cent of the total. When the diet consisted entirely of carbohydrates or fat a mean value of 85 to 86 per cent was noted.

Studies of a vegetarian diet with special reference to the nervous system, circulation of the blood, and diuresis, R. Staehelin (*Ztschr. Biol., 49 (1907), No. 2, pp. 199-282, figs. 4*).—From experiments with himself and other subjects, the author concludes that proteids of different origin (from rice and potatoes) differ in respect to inducing nitrogen equilibrium in the body. The dry matter of the feces on the different diets studied contained the same percentage of nitrogen so that the excretion through this channel would be determined by the amount of feces excreted.

On account of its lower energy value the author considers vegetable food preferable for the treatment of obesity, as such diet produces fewer disturbances. The author also believes a vegetarian diet useful in the treatment of dipsomania.

A vegetarian diet exercised no effect on body temperature. In some cases the gas formation in the intestine was greater on a vegetarian diet than on a meat diet and in some cases smaller. Peristalsis was increased by the vegetarian diet.

Judging by the results of ergographic experiments a vegetarian diet exercised no effect on the nervous system or upon muscular work. The work of the kidneys, as shown by the nitrogen excretion and other experimental data, was less on a vegetarian diet than on a mixed diet or milk diet. Other conclusions have to do with pulse frequency, blood pressure, viscosity of the blood, etc. An extended bibliography is appended to this report.

A physiological study of vegetarians, Mlles. I. Ioteyko and V. Kipiani (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 114-207, pls. 3*).—The authors discuss various questions connected with vegetarianism and report studies regarding the kinds and amounts of food eaten by 43 vegetarians of both sexes living in Belgium. In a number of cases muscular power was studied with an ergograph and with a dynamometer.

The authors' conclusions are favorable to vegetarianism and such a form of diet in their judgment is of value in counteracting alcoholism. Meat, they believe, should be considered a drug like alcohol and its use regulated on this basis. Dynamometer tests, according to the authors, showed that the endurance of the vegetarians was greater than was the case with flesh eaters, average values from earlier work with flesh eaters being selected for the comparison. Comparisons of the dynamometer force, calculated as kilograms, gave practically the same results for vegetarians and flesh eaters, namely, 38 kg. for the former and 37 kg. for the latter. Lung capacity and body size were studied as well as some psychological measurements.

The rational feeding of infants from birth to two years of age, H. Klose (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 363–442, dgms. 9*).—The author considers in some detail the problem of the rational feeding of infants, and reports several observations on artificial feeding according to different formulas. An extensive bibliography is appended.

The rational feeding of infants from birth to two years, Michel and Perret (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 209–363, dgms. 9*).—Noted from another source (E. S. R. 18, p. 959).

How to nourish infants, Sosnowska (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 443–449*).—A brief consideration of the possibility and, in the author's opinion, desirability of nourishing infants of 9 months and even younger on vegetarian or fruitarian diet.

Eggs in the diet of infants, W. J. Midelton (*Brit. Med. Jour., 1907, No. 2422, p. 1302*).—On the basis of experience, the author recommends eggs as a substitute for mother's milk in infant feeding. For the first 2 days after birth a mixture of egg white, water, and cane sugar is used; afterwards egg yolk is added in increasing amounts together with a little cod-liver oil emulsion.

The nourishment of youths of both sexes in the family and in educational institutions, P. Legendre (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 450–468*).—A discussion of the principles of alimentary hygiene as applicable to the feeding of children from 6 to 16 years of age, with special reference to methods of modifying the diet of a group or an institution to meet the needs of individuals. The article includes an account by L. Aman of the dietary régime of a large orphanage as established in accordance with the principles discussed.

The food of Belgian farmers and farm laborers, A. Lonay (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 70–83*).—Food customs of the agricultural population in different districts of Belgium are described and many data regarding the kinds and amounts of food eaten are summarized.

The author believes that the facts warrant the statement that the agricultural population of Belgium, though they are the food producers, do not themselves have a diet which other laborers would envy. He calls attention to the fact that existing conditions have been recognized by the Belgian minister of agriculture, and quotes largely from a circular which has been widely distributed by the minister giving practical directions for the improvement of the diet.

The investigations of the Institute Solvay on the food of Belgian laborers, P. Heger, A. Slosse, and E. Waxweiler (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 1–33*).—In this extended investigation of sociological and other conditions and their effect upon the diet of Belgian laborers, records kept in 1,250 families representing about 6,000 persons were gathered. Of these, 1,065 were sufficiently detailed and accurate to include in the summary and discussion.

The results were classified in two ways, namely, according to the work, whether moderate, severe, or very severe, and according to regions, whether urban, industrial districts, or rural communities, and the attempt was made to discover the relation of these factors to diet. In nearly nine-tenths of the total number of families the daily quantity of protein was 105 gm. or less per man per day and in over half it was less than 85 gm. The energy was not far from 3,400 calories as a mean value.

According to more detailed studies which were made with 33 persons the protein obtained per man per day ranged from 65 to 140 gm. or about 92 gm. as a mean, and the energy not far from 3,000 calories.

As regards the influence of the character of the work, it appeared that this did not materially modify protein consumption, which on an average was not so high in the industrial regions as in the other localities studied.

Notes on workingmen's diets at the beginning of the twentieth century, O. Piequet (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 84–92*).—Some years ago the author collected statistics regarding the expenditures of workingmen's families in Alsace and found that, generally speaking, 50 to 75 per cent of the total income was expended for food, the average value in 16 families being 61 per cent. Of this, 33 per cent of the total was expended for bread, 14 per cent for meat, 13 per cent for milk, 24 per cent for groceries, and 16 per cent for beverages, vegetables, and sundries.

Some data are also given regarding the food habits of German and Spanish laborers as compared with French. The author calls special attention to the restaurants which some manufacturers have established to supply their employees with food at reasonable prices.

Economic conditions of workingmen, A. Imbert (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 42–55*).—A detailed study of a workingman's expenditures for food and lodging, car fares, etc., and the calculated cost and nutritive value of the food used in 7 days. The average amounts of nutrients supplied were protein 105.5, fat 33.5, and carbohydrates 618.8 gm.

The irrational and insufficient diet of Parisian laborers and workingmen and the necessity for instruction in food in all schools, L. Landouzy (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 34–41, tables 4*).—On the basis of extensive inquiry into the subject the author concludes that workingmen in Paris do not have a rational or adequate diet. Suggestions for bettering conditions are made and summarized in tables designed for popular instruction, which give data regarding the composition of food, menus suited to different seasons of the year, and other information of a similar nature.

The energy value of meals served in dairies and other restaurants, J. Thibot (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 2, pp. 56–69*).—The author has collected data regarding the meals served for a fixed price in Paris restaurants of different grades and has calculated their nutritive value.

A report on army rations, L. Perrier (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 469–493*).—A summary and discussion of data gathered by the author regarding the diet of soldiers under different circumstances in the French army. Dietary standards are proposed for different branches of the service, which are believed to be more in accord with the rational principles of diet than are the rations at present furnished.

The diet of the soldier, A. Drouineau (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 494–516*).—A consideration of the dietary needs of the soldier and a summary of data regarding army rations in different countries.

Dietary losses in the army and means of avoiding them, A. Drouineau (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 517–523*).—The value of variety in the diet, proper cooking, serving, etc., in securing more complete consumption of food and preventing waste is explained.

Barrack rations, A. Moll-Weiss (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 524–535*).—Suggestions are offered for improving the dietary conditions of soldiers by special attention to the quantity and quality of the food and to its preparation and service.

The diet of merchant marines, J. P. LANGLOIS (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 536-569*).—Data regarding the feeding of sailors in different countries are summarized and discussed and suggestions for modification and improvement are offered.

The feeding of the French merchant marines, TARTARIN (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 3, pp. 570-573*).—Existing conditions are briefly explained, some typical menus given, and methods of improvement suggested.

Good housekeeping in the wilderness, FLORENCE S. GLEESON (*Outlook, 86 (1907), No. 4, pp. 195-202, figs. 15*).—Camp cookery and related questions are discussed and recipes for preparing a number of camp dishes are given.

Officials charged with the enforcement of food laws in the United States and Canada, W. D. BIGELOW (*U. S. Dept. Agr., Bur. Chem. Circ. 16, rev. ed., pp. 32*).—The information contained in this circular has been revised to July 1, 1907.

ANIMAL PRODUCTION.

Information regarding the new feed law, J. W. CARSON and G. S. FRAPS (*Texas Sta. Bul. 95, pp. 24*).—This bulletin sets forth and explains the provisions of the law regulating the sale of feeding stuffs in Texas and gives the composition of a number of feeding stuffs on the Texas market, some of which have been reported in previous bulletins. These materials include wheat bran, wheat shorts, wheat chops, corn chops, corn bran, corn-and-cob meal, cotton-seed meal, rice bran, rice meal, rice polish, Kafir corn chops, ground Kafir corn, Kafir corn meal, Kafir corn heads, chopped Kafir corn heads, milo maize meal, milo maize chops, milo maize heads chopped, milo maize fodder, Kafir corn fodder, alfalfa, sorghum fodder, meng bean, cowpeas, star grass, hay of different sorts, tallow weed, palmetto seed, and a commercial feed.

The law, which is similar to that passed by a number of other States, provides for the examination and proper tagging of all concentrated feeds except whole or unground grains or seeds, and punishes violations by fine or imprisonment or both. The granting and canceling of registration and the collection of samples for analysis are invested by law in the director of the State experiment station, and the tax of 10 cts. per ton of concentrated feeding stuffs is to be used for expenses incurred in the enforcement of the law.

Inspection of feeding stuffs (*New York State Sta. Bul. 291, pp. 323-369*).—Under the provisions of the State feeding stuff law 388 samples were analyzed of cotton-seed meal, linseed meal, gluten feed, corn bran, dried distillers' grains, malt sprouts, dried brewers' grains, hominy feeds, compounded or commercial mixed feeds, meat meal and other similar animal products, poultry feeds, sugar-beet wastes, barley by-products, oat by-products, alfalfa meal, pea meal, clover meal, spiced clover, boat sweepings, cereal breakfast food by-products, rye grains, and gluten. "About 31 per cent of the brands inspected are feeds carrying a relatively high proportion of protein and which, in most cases, bear names that are indicative of their character. The hominy feeds and animal products are also materials having a fairly definite composition and concerning the nutritive value of which an approximate estimate may be made. On the other hand about 44 per cent of the feeds examined is made up of brands compounded from a variety of materials that bear names in many cases savoring of quackery. These brands, in a majority of cases, are simply a means of selling at grain prices inferior by-products that could not be floated on the market unless disguised in some way. The extensive sale of such mixtures is not creditable either to the intelligence or the business judgment of the purchasing public. It is no exaggeration to state that at the present time the conditions of the feeding stuff market are bad and are inimical to the financial interests of the farmers and other consumers."

Feeding stuff control in 1906, WEHNERT (*Landw. Wchnbl. Schles. Holst., 57 (1907), No. 38, pp. 621–625*).—Data regarding the extent of the feeding stuff control work in Schleswig-Holstein.

The ash constituents of food stuffs, H. INGLE (*Transvaal Agr. Jour., 5 (1907), No. 19, pp. 647–656*).—A number of general deductions are drawn from a discussion of the importance of mineral constituents in the feeding of farm animals. As the author points out, "in the seeds there is a concentration of some of these mineral constituents, particularly of phosphoric acid, potash and magnesia, with relatively little lime. In the leaves and stems of certain plants, lime is, relatively to the phosphoric acid, much more abundant than in the seeds. Cereals are remarkable for the low proportion of lime to phosphoric acid contained in both their seed and straw. Leguminous plants, e. g., lucerne, clover, peas and beans, contain a high proportion of lime in their leaves and stems.

"Lime and phosphoric acid are required for the formation of bones in animals in the proportion of about 1.5 of lime to 1 of phosphoric acid, and, in all probability, these are the proportions in which these constituents should be present in the rations of the animals in order to give the most favorable conditions for healthy growth. Animals require, for their proper growth, supplies of chlorids, fluorids, iron, and probably other substances which may not be present in sufficient quantity in their food.

"A diet composed exclusively of cereals, e. g., oat hay or oat hay and mealies [i. e. corn], is not suitable for animals, and the preponderance of phosphoric acid in such a diet should be compensated by the addition of foods rich in lime, e. g., lucerne, clover, or even grasses."

The chemical composition of Washington forage crops. Analyses of grains and concentrated feeding stuffs, R. W. THATCHER (*Washington Sta. Bul. 82, pp. 32*).—The forage crops analyzed in continuation of earlier work (E. S. R., 18, p. 436) included timothy hay, hay from wild oats, bald barley, spelt, oats, oats and peas, macaroni wheat hay, Proso millet, wild pea or mountain vetch, pine grass and other mountain range grasses, hay from redtop and other grasses, timothy and alsike hay, clover hay, green rape, carrots, and ruta-bagas. In a number of cases the crops were cut at different stages of growth.

The concentrated feeds analyzed included oats of different varieties, flaxseed, flaxseed and bran, ground barley, soft wheat, dried blood, buckwheat middlings, cotton-seed meal, gluten meal, gluten feed, coconut meal, oat hulls, and dairy feeds.

Some of the deductions drawn from the analytical work follow:

"The analyses of timothy hay show that the stage of maturity at which the crop has its highest feeding value is from 3 to 5 days after it has reached full bloom.

"Wild oats if cut very early yield hay of high protein content and fair feeding value, but if allowed to stand until nearly mature produce hay of very poor quality.

"Bald barley, spelt, and oats show only slight variations in total feeding value during the period of formation of seeds, but their nutritive ratio grows wider owing to the decrease in the percentage of protein, or flesh-forming material and increase in fats and carbohydrates, or energy-producers. This is especially noticeable in the case of the barley which, moreover, has a wide ratio at all stages of growth and should, therefore, be cut for hay at as early a stage of growth as is consistent with good yields per acre. Spelt produces hay of a narrower nutritive ratio than any other grain hays, and is hence a valuable hay crop in this State where most of our hays have a wider ratio than is wholly desirable. . . .

"Analyses of samples of 6 grasses from the mountain ranges show them to be richer in protein than similar grasses grown in other sections of the State. . . .

"Wheat, bran, and shorts show wide variations in their protein content, both as between different varieties and between different samples of the same variety. The protein content of bran and shorts is directly proportional to that of the wheat from which they are milled.

"The commercial feeding stuffs which were analyzed show great variations in composition and feeding value, indicating the possibility of purchasing in the State any desired kind of feed with which to balance up a ration."

The State feeding stuff law is quoted in an appendix.

Sweet clover as a pasture plant, J. E. Wing (*Breeder's Gaz., 52 (1907), No. 9, p. 370*).—In a discussion of sweet clover in new alfalfa pastures the statement is made that this clover is prized in Alabama and other regions, especially in early spring, as pasturage for sheep.

Report of the animal husbandman, G. E. Morton (*Wyoming Sta. Rpt. 1907, pp. 115-125*).—Brief statements are made regarding the work which has been undertaken with horses, cattle, sheep, and pigs. Data are recorded regarding the weights and gains of Tamworth pigs, ewes and lambs, and Hereford bull calves, and the weights and measurements of Hereford heifers at the station. Information is also given regarding the improvements at the station stock farm.

Feeding Tennessee steers in Georgia. The outlook for beef production in Georgia, C. L. Willoughby and P. N. Flint (*Georgia Sta. Bul. 76, pp. 36, figs. 4*).—The authors state that few cattle are raised for fattening purposes in Georgia, it being the common custom to purchase animals for this purpose from Tennessee. Two tests on the possibilities of feeding such cattle are reported and the outlook for beef production in Georgia discussed.

In the first test, which was made with 3 lots of 4 animals each, cotton-seed hulls, shredded corn stover, and shredded corn fodder with corn silage were compared for feeding with grain. With the cotton-seed hulls and stover the grain ration consisted of cotton-seed meal and bran 1:1, and with the corn silage shorts also formed a part of the grain ration, and a small amount of cowpea hay and hulls was fed with the silage. Owing to the fact that an insufficient amount of silage was provided, green rye was substituted for it during the latter part of the feeding period, which covered 112 days and was divided into 2 periods of 48 and 64 days each, respectively. With the lots fed cotton-seed hulls and corn stover the rations were reversed at the end of the first period.

Considering the test as a whole, the average daily gains on the several rations were cotton-seed hulls 2.64 lbs., shredded corn fodder 2 lbs., and corn silage 2.09 lbs. per head per day, the digestible nutrients required per pound of gain being 4.35, 7.27, and 7.72 lbs., and the cost of a pound of gain 5.39, 8.05, and 8.68 cts.

In the second test, which was made with 1 lot of 3 steers and 2 lots of 4 steers each, cotton-seed meal alone and with shelled corn 1:1 and 7:13 were compared, shredded corn fodder supplementing the grain in each case. In the 90 days covered by the test the average daily gain on cotton-seed meal was 1.28 lbs., the digestible feed required per pound of gain 7.65 lbs., and the cost of a pound of gain 10.52 cts. Similar values for the ration containing the smaller amount of shelled corn were 1.74 lbs., 6.45 lbs., and 8.05 cts., and for the ration containing the larger amount of corn, 1.89 lbs., 6.10 lbs., and 7.37 cts.

A slaughter test showed that with all 3 lots the dressed weight on an average was not far from 50 per cent of the live weight.

Two pigs following the steers fed the smaller corn ration made an average daily gain of 0.57 lb. per pig, while 2 similar animals following the steers fed the larger amount of corn gained an average of 1 lb. per pig per day.

As regards the effect of a balanced ration for steers "when cotton-seed hulls were fed with bran and cotton-seed meal, greater gains were made, even though the ration was not well balanced, than when shredded fodder was used as roughness, in which case the ration is more nearly balanced. When feeding shredded fodder with cotton-seed meal, better gains were produced when enough corn was added to the ration to make it more properly balanced. . . . It should be the aim of the feeder to buy steers in thin condition to secure the largest gains.

"Individual steers vary in their capacity to make gains, and their gains are by no means uniform throughout the feeding period. The steers that were the best eaters made the greatest and most even gains. Other factors being equal, the steers that have the best beef form, square and blocky, will make the best feeders and dress the highest percentage of salable carcass when slaughtered."

"The general conclusion from this work is that the profit in feeding steers purchased in other States must be found more in pork and manure produced than in direct cash returns, at the prices now prevailing for feed and for beef on the hoof. It is believed that the greatest hope of profit in beef production lies in raising the proper kind of calves and yearlings for this purpose, and in feeding well-selected native grade steers purchased from 2 to 2.5 cts. per pound."

Steer feeding under eastern Washington conditions, E. E. Elliott and W. A. Linklater (*Washington Sta. Bul. 79, pp. 19, figs. 4*).—The authors discuss present conditions of cattle feeding in Washington and the possibilities of increasing this industry. The majority of cattle which are raised are fed on alfalfa, and some statistics of gains which have been obtained by different feeders and related matters are presented which were derived from answers to inquiries sent throughout the State.

A feeding test covering 11 weeks was made with 3 lots of 4 steers each, to compare barley and sprouted wheat alone and in combination, fed with wild oat hay. Owing to a misunderstanding the steers were fed at the beginning of the test 8 lbs. of grain per head daily instead of a smaller amount, and this quantity was continued, though, as shown by the droppings, the amount eaten was at first too great. Later the amount was increased to 12 lbs. The average daily gain on barley was 2.23 lbs. and the cost of a pound of gain 8.02 cts. Similar values for the wheat ration were 2.37 lbs. and 6.72 cts., and for the wheat and barley ration, 2.39 lbs. and 7.01 cts. The smallest calculated profit, $11.18, was secured with the barley ration and the greatest profit, $16.99, with the mixture of the 2 grains.

The wheat used in the above test had stood in the shock through a rainy period and was about one-third sprouted, though it was dry and in good condition when fed.

"The . . . results go to show that there is profit in steer feeding even when both feed and cattle have to be bought, and especially that the farmer who produces his own feed can feed it to steers on his farm and secure better than market prices for the feed, besides producing considerable manure which must as time goes on become an important factor in Washington agriculture. This feeding of crops on the farm is especially pertinent in cases where either the roughage or grain is so damaged or poor in quality that they have a low market value. The wheat fed in this feeding experiment had no market value at all except for feed, but about 75c per bushel was realized by feeding to steers."

The feeding stuffs used were analyzed.

Concerning the use of homogenized milk for pig and calf feeding, G. Wilsdorf (*Deut. Landw. Presse, 34 (1907), No. 44, pp. 363, 364*).—Data summarized regarding the results obtained when homogenized milk was fed to pigs and calves indicate, in the writer's opinion, that milk so treated is of decided value as a feeding stuff.

Ration experiments with swine, G. E. Morton (*Wyoming Sta. Bul. 74, pp. 18, figs. 3*).—The increased local interest in pig breeding led the author to test a number of rations to determine whether other grains may replace corn, and to study the value of alfalfa and the quantity in which it should be fed.

When corn and shorts 2:1, bald barley, and wheat were compared for 11 weeks the gains per head were, respectively, 57.5, 36.8, and 50.8 lbs., and the feed eaten per pound of gain 6.35, 8.37, and 6.09 lbs. These are also the figures for the cost of a pound of gain, as all the grains were rated at a cent a pound.

When wheat meal and corn meal were compared the average gain in 11 weeks was 114 and 76.3 lbs. per head, and the cost of a pound of gain 4.49 and 4.98 cts.

When young sows were fed wheat meal and alfalfa hay with and without turnips for 16 weeks the average gains per head were 105.5 lbs. without turnips and 103.5 lbs. with turnips, and the cost of a pound of gain 4.36 and 4.70 cts.

Wheat meal and alfalfa hay, according to the author, is a cheaper ration than either corn alone or wheat alone, and such a ration produces about the same amount of gain as corn. "Wheat produces much greater gains than alfalfa hay and wheat, and while it is somewhat more costly than the latter ration, the additional thrift and the saving in labor tends to offset this."

When corn meal and shorts 1:2, corn meal and alfalfa hay 1:2 with and without swill, and wheat meal and alfalfa hay 1:2 with swill were compared with pigs weighing 60 to 90 lbs., gains of 20.3 and 3.0 lbs. per head were noted, respectively, with the corn meal and shorts and the corn meal and alfalfa hay rations, and losses of 1 lb. per head in both the rations with swill. This test, in the author's opinion, shows that alfalfa-hay rations are "wholly unsuited for young shoats."

A ration of corn meal, shorts, alfalfa hay, and turnips fed to sows for 7 weeks resulted in an average gain of 71 lbs. per head, at a cost of 3.11 cts. per pound, and this ration, according to the author, proved satisfactory, "showing sufficient gain in mature sows to indicate thrift."

When a sow weighing 341 lbs. was wintered on alfalfa hay and beets without grain a loss of 6 lbs. was noted.

The author discusses the general subject of growing and feeding pigs and gives an illustration of a covered box divided into compartments and having round holes on the side for use in feeding alfalfa hay to pigs.

Corn and various amendments as food for hogs, A. M. Soule, J. R. Fain, and M. P. Jarnagin (*Virginia Sta. Bul. 167, pp. 235–257, figs. 5*).—As it is generally conceded that dry feed alone, especially corn, is not the most satisfactory feed for pigs, 5 series of tests were made in which the value of various supplementary feeds was studied in comparison with corn meal alone. The supplementary feeds included middlings in different proportions, skim milk, linseed meal, red dog flour and different proportions of animal meal. The pigs were from 4 to 9 months old and the individual tests covered from 44 to 100 days.

In the 3 lots fed corn meal alone, the average daily gain per head was 0.24, 0.27, and 0.28 lb., respectively, while the feed eaten per pound of gain ranged on an average from 6.8 to 15 lbs., and the cost of a pound of gain from 6.05 to 13.44 cts.

Considering the tests in which corn meal was supplemented, the average daily gain ranged from 0.65 lb. per head on corn meal and linseed meal about 5:1 to 1.43 lbs. on corn meal and skim milk. The amount of concentrated feed eaten per pound of gain ranged from 3.1 lbs. with the 2 lots fed corn meal and linseed meal to 6.1 lbs. on corn meal and middlings 2:1. On the rations with supplementary feeds corn meal and middlings were most expensive, a pound of gain costing 6.47 cts. The gain was most cheaply made with corn meal and skim milk and corn meal and linseed meal, costing in each case practically 3.2 cts. per pound.

Of the 3 lots fed corn meal and skim milk 1:4, one had the run of a bare lot and one of a grass lot, while the third was confined in a pen. The last-mentioned lot made the greatest gain, 1.43 lbs. per head per day, while the smallest gain, 1.32 lbs. per head per day, was noted with the pigs in the bare lot.

In one of the tests, red dog flour and corn meal were fed soaked and in the other unsoaked. The gains in the 2 cases were, respectively, 1.28 and 0.89 lbs. per head per day.

Some of the general conclusions which were drawn from the test follow:

"When either middlings or linseed meal was added to a ration of corn meal in proportion to supply an equal relative amount of digestible protein, the gains were practically the same, and increased very markedly over those obtained where corn meal alone was fed. . . .

"It appears that it would not pay to feed more than 10 lbs. of meat meal per 90 lbs. of corn meal.

"With hogs varying in age from 4 to 6 months, it appears that from 0.75 to 1 lb. of gain per head per day may be expected when corn meal and protein amendments are fed, or from three to four times the gains obtained where corn meal alone is fed. . . .

"Hogs nine months of age made gains of 1.26 and 1.35 lbs. on corn meal and middlings and shelled corn and middlings, respectively, as compared with gains of 0.67 and 0.86 of a pound for five-months hogs fed on various rations of corn meal and middlings. . . .

"A good profit may be anticipated by the careful feeder of hogs on a margin of 50 cts., an excellent profit on a margin of $1, and large profits on margins of $1.50 and $2.

"These results show conclusively that it is false economy, and wrong theoretically and practically, to attempt to maintain hogs on corn meal alone, and that much larger and better gains will be secured by feeding the hog rationally and in accordance with his natural requirements, as indicated by his origin, his inherited qualities and natural instincts, and as shown by the investigations of scientific workers in the fields of physiology and nutrition."

Forage crops for hogs in Kansas and Oklahoma, C. E. QUINN (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 111, pt. 4, pp. 24*).—On the basis of information gathered from a number of successful swine growers in Kansas and Oklahoma, pig raising for these regions is discussed.

The importance of pasturage for pigs is every year becoming more recognized, as the author points out, and in the opinion of 95 per cent of the farmers interviewed no pasturage is better for pigs than alfalfa where it can be successfully grown. Wheat, oats, and rye have also proved important, while clover, rape, sorghum, cowpeas, soy beans, grasses, root crops, and pumpkins are less important crops for the purpose. Alfalfa hay has also been found very valuable for pigs as part of a winter ration, particularly with brood sows before farrowing. "Where it is fed during the winter only a small grain ration is necessary to keep the sows in good flesh and in healthy condition. Sows thus fed also farrow good litters of strong healthy pigs." The system of feeding pigs on pasturage was found to vary decidedly. "Hogs that have plenty of range and exercise are not nearly as susceptible to disease as those confined in a small pen. A hog that goes out after his feed will be well grown and thrifty, accustomed to the elements and not liable to be injured by a sudden change of weather. It is difficult to put a good finish on hogs while running in a large pasture. If they are allowed to run on good pasture until three weeks or a month before sending to market, and are then shut up and given all the corn they want, with plenty of pure water, they will make very rapid gains."

Dried potatoes a good feed for horses, E. Parow (*Ztschr. Spiritusindus., 30 (1907), No. 37, p. 399*).—A summary of data from which the conclusion is drawn that dried potatoes are a very satisfactory feed for horses.

The goat, J. Crepin (*La Chèvre. Paris, 1906, pp. XVI+339, pls. 14, fig. 1*).—The history and methods of goat raising, their value as farm animals, breeds, and related questions are discussed in this handbook.

The goat industry in western Washington, D. A. Brodie (*Washington Sta. Bul. 78, pp. 23, pl. 1, figs. 4*).—Feeding, care, and management of Angora goats, uses of the fleece and skins, value of the flesh as food, the use of Angora goat milk, and related questions are considered with special reference to the Angora goat industry in Washington, where these animals have been raised to some extent for many years. At the present time in western Washington the most important use is to clear lands.

"The number of goats required to keep the leaves and buds eaten off sufficiently to kill the brush depends on the nature and thickness of the brush. Judging from the appearance of the station pasture after one year's grazing, it is believed that in another year the brush will be nearly all killed. In this case there was one goat to each 1⅓ acres. The general opinion in the Willamette Valley is that on the average it requires two goats to the acre to kill the brush."

The pasture is not only cleared by the goats but is materially improved by the goat manure.

"In our climate it is advisable to feed some hay and grain during the severest part of the winter, in order to keep them in good condition. A little hay in or near the shed to be used on stormy days will be found very beneficial. When conditions are such that they can not go out to browse they can be kept nicely on any of the common fodders."

Camels for transport (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 6, pp. 593–604*).—A discussion of the suitability of camels for Natal. Data are quoted showing the satisfactory results obtained with these animals in German Southwest Africa and Rhodesia. Information is given regarding the feeding, care, and management of camels and related topics.

Farm poultry (*North Carolina Sta. Bul. 195, pp. 35, figs. 26*).—Construction of poultry houses and poultry yards, breeds of fowls, selection of breeding stock, feeds and feeding, and related questions are considered in a general discussion of poultry raising, and a report is made of the station experiments in pedigree work for egg production, the value of green feed, and the comparative keeping quality of fertile and infertile eggs.

In keeping records of eggs with a view to securing breeds of superior egg production, it is stated that trap nests have given very satisfactory results.

As regards the effect of green feed, a lot having access to green rye laid 240 eggs in 3 months, while a similar lot fed no rye laid 177 eggs. The basal rations fed and other conditions were uniform.

In a test of the relative keeping quality, the fertile and infertile eggs were gathered for two weeks and kept in a comparatively cool incubator cellar for an additional week and then broken and examined. Fifteen per cent of the eggs from the pens with male birds were bad and the quality of the remainder was not as good as was the case with the infertile eggs, none of which were bad though some were slightly shrunken.

Advanced methods of poultry farming, A. W. Foley (*Prov. Alberta Dept. Agr., Poultry Bul. 1, pp. 63, figs. 49*).—The author has incorporated the results of Canadian station experience in poultry farming in this general discussion of poultry houses, nests, and other appliances, the feeding and marketing of poultry, and other questions concerned with the general subject of poultry raising.

Experiments with ostriches, I, J. E. Duerden (*Agr. Jour. Cape Good Hope, 30 (1907), No. 5, pp. 668–670, pl. 1*).—Experimental data on the effect of feed and other conditions on feather development are summarized as follows:

"The ostrich is naturally very sensitive to changes in its surroundings or treatment, readily falling off in condition when moved from one set of conditions to another, or changed from one kind of food to another. This falling off tends to produce a check in the feather growth, and may result in the production of a bar.

"Different strains of ostriches differ greatly in their responsiveness to such changes, and this should be taken into account in selective breeding.

"A prolonged low state of health of a bird may result in very imperfect growth of the feathers during the period, independently of any check in the growth.

"For the best feather production the constitution of the bird, its actual state of health, and freedom from injuries and parasites must be inquired into, as well as the quantity and nature of the food."

DAIRY FARMING—DAIRYING—AGROTECHNY.

Protein requirements for dairy cows, A. M. Soule, J. R. Fain and M. P. Jarnagin (*Virginia Sta. Bul. 169, pp. 293–313, figs. 8*).—Four groups of 4 cows each, quite uniform in weight and in stage of lactation, were fed for 30 days on a ration practically uniform for each group, supplying each cow on an average about 23 lbs. of dry matter containing about 1.8 lbs. of protein per day and having a nutritive ratio of about 1 : 8. For the next 80 days the ration was changed so that while the quantity of dry matter did not vary much from 23 lbs. for the different groups, the digestible protein in the rations ranged from 1.49 lbs. per cow in the lowest case to 2.39 lbs. in the highest, and the corresponding nutritive ratios from 1 : 10.2 to 1 : 6.4. In the final 30 days the ration was nearly the same as that of the initial period.

From a comparison of the yields of milk and butter and the gains or losses in weight by the several groups on the different rations, the authors conclude that rations supplying less dry matter and less digestible protein than called for by the Lehmann standard may be fed to dairy cows, while maintaining satisfactory yields of milk and butter and keeping the cows in good health.

The increase of the quantity of dry substance in the ration, A. G. Morstin (*Ber. Physiol. Lab. u. Vers. Anst. Landw. Inst. Halle, 1907, No. 18, pp. 42–95*).—The author conducted a series of feeding experiments with 6 cows of 3 different breeds, using lucerne hay, oat straw, potatoes, cocoanut meal, peanut meal, wheat bran, and rye meal as feeding stuffs. The quantities of the different materials were varied in the several feeding periods in accordance with the purposes of the study. From the results the author concluded that, provided the proper nutritive ratio was maintained, neither gradual nor sudden changing of the quantity of dry matter in the ration had any influence either upon the digestion or health of the cow or upon the milk or butter fat production.

Report of feeding tests for 1904–1907, VAN DER ZANDE (*Verslag. Ver. Exploit. Proefzuivelboerderij Hoorn, 1906, pp. 13–64*).—This article gives the details of a study of the relative value of a ration containing fodder beets, straw, hay, cotton-seed meal, and peanut meal as compared with the hay and linseed meal ration in common use for milch cows. For 3 seasons 2 groups of 10 cows each, each group as nearly uniform as possible as to milk production and yield of fat and of dry matter, were used in these tests, one group being fed with the former ration and the other with the latter ration.

The data discussed by the author are those regarding the quantity of milk and of fat and total dry matter in the milk, the quantity and quality of cheese and butter, the changes in the live weight of the animals, and the financial outcome of the two methods of feeding. In the average for the 3 years the milk production was 10.5 per cent larger on the beet ration, and the average fat content 0.2 per cent lower, while the dry-matter content of the milk was the same on one ration as on the other. The total quantity of dry matter produced was 9.4 per cent more, that of fat 3.2 per cent more, of cheese 9.5 per cent more, of cream butter 5.7 per cent more, and of whey butter 15 per cent more on the beet ration than on the other.

Report of fodder tests at Uithuizen, conducted during the winter 1906-7, C. K. VAN DAALEN (*Cultura, 19 (1907), No. 230, pp. 657–676*).—The data of the tests are given in detail and fully discussed. As these comprised only one series with the rations studied, definite conclusions are not drawn, but the results indicate that beet tops constitute a fodder that, with hay, straw, and concentrates, may be fed to milch cows with profit, and that fodder beets may advantageously replace part of the concentrates. Fodder beets had a more favorable influence on the quantity of milk and butter fat than the beet tops, and the live weight of the animals increased on the ration containing the former. As compared with this, however, the cost of the ensiled beet tops was less, Fodder beets showed the most favorable effect in respect to milk and butter-fat production. As regards the butter fat, there was little difference between the results from concentrates and those from ensiled beet tops.

On the feeding of milch cows, O. KELLNER (*Mitt. Ökonom. Gesell. Sachsen, 1906–7, pp. 115–128*).—A lecture discussing results and conclusions from recent German investigations.

Report of Alnarp agricultural and dairy institute, 1906 (*Ber. Verks. Alnarps Landtbr. Inst. och Mejeri Inst., 1906, pp. 43+XXXXVI*).—The report gives the usual account of the work of the institutes during the year. A feeding experiment with legumes (ground peas) *v.* oil cakes for milch cows, conducted by the dairy department, is also reported.

Twentieth annual report of the Bern dairy school at Rütti-Zollikofen (*Jahresber. Molk. Schule Rütti-Zollikofen, 20 (1906-7), pp. 61*).—This includes, in addition to an account of educational matters at the dairy school, a summary of articles on the work of the year at the dairy institute on centrifuging the whey from fat cheese to recover the residual butter fat, results of the control of the quality of milk and milk products, analysis of margarin cheese, observations on the influence of fertilizer on the fitness of milk for cheese making, and various statistics regarding the cheese and creamery industries.

Hjedding cooperative creamery, 1882–1907 (*Mälkeritid, 20 (1907), Nos. 23, pp. 449–471; 25, pp. 487–498, figs. 11, dgms. 4*).—The history of the first cooperative creamery established in Denmark, published on the occasion of its twenty-fifth anniversary, with views and plans of the original and the new buildings, and pictures of the presidents of the creamery association.

Test associations and breed improvement, N. Hansson (*Nord. Mejeri Tidn., 22 (1907), No. 33, pp. 387–389*).—An address delivered at the Third Scandinavian Agricultural Congress in Christiania, Norway, 1907. The number of dairy "test" associations in Sweden, June 1, 1907, was 459, the first association having been organized in 1898 at Hvilan agricultural school (near Malmö). The work of the test associations in Malmöhus County and its importance for the improvement of the dairy herds in the region are discussed in the address.

Report of the spotted Swiss cattle breeders' association. J. de Wattenwyl, J. Käppel, and G. Lüthy (*Ann. Agr. Suisse, 8 (1907), No. 3, pp. 113–161*).—The average annual yield of 66 cows of this breed was 3,754 kg. of milk, with a fat content of 3.93 per cent and that of dry matter 13.06 per cent.

Observations regarding the fat content of milk. J. H. Edelman (*Cultura, 19 (1907), No. 230, pp. 685–689, dgms. 2*).—The influence of family characteristics on the fat content of milk is considered. The variations in the fat content of the milk of a dam and two daughters from different sires were quite similar during the milking period, and the averages for the cows during the whole period were, respectively, 2.84, 2.88, and 2.94 per cent. The author concludes from this that the low fat content of milk is due in large part to the poor quality in this respect of cows used for breeding.

The sterilization of milk by heat, E. Kohn-Abrest (*Rev. Soc. Sci. Hyg. Aliment., 4 (1907), No. 1, pp. 25–34*).—The author considers some features of the present knowledge regarding the treatment of milk for use in cities, especially that from tuberculous cows.

In his opinion, heat is the only agent of preservation allowable from a hygienic standpoint. Milk obtained from healthy cows under sanitary conditions, if pasteurized immediately, will keep for at least 24 hours at ordinary temperature and longer at lower temperature. If the milk is to be preserved for a considerable period it must be sterilized. Milk from tuberculous cows contains products of secretion from the tubercle bacillus that are not destroyed by heat. It is not definitely known at present whether these products are innocuous or not, and consequently it is impossible to state whether the milk from tuberculous cows is harmless or not, even if it has been pasteurized or sterilized.

Effect of treating milk with carbon dioxid gas under pressure, L. L. Van Slyke and A. W. Bosworth (*New York State Sta. Bul. 292, pp. 371–384, figs. 7*).—In a series of experiments made to determine the effect of carbon dioxid under pressure on the development of lactic acid in milk, fresh separator skim milk, fresh whole milk, drawn and handled under good hygienic conditions, fresh skim milk pasteurized at 185° F., and fresh whole milk pasteurized at 185° F., were treated with the gas at pressures of 70, 150, and 175 lbs. and then kept at temperatures varying from 35° to 75°. "Pasteurized milk, carbonated, kept for 5 months with little increase of acidity. Fresh, whole milk, carbonated, kept in one experiment for about the same length of time." The effect of carbonated milk upon organisms other than lactic was not studied in this investigation.

Carbonated milk, F. H. Hall (*New York State Sta. Bul. 292, popular ed., pp. 4, fig. 1*).—A popular summary of the above.

Report of the permanent Finnish butter exhibitions for 1905, A. Andelin and G. A. Bredenberg (*Landtbr. Styr. Meddel., 54, 1907, pp. 28*).—During the year 221 creameries, of which 132 were cooperative, participated in these exhibitions and 1,059 tubs of butter were scored and examined for water content, refractive index, and volatile acids in the fat. The water content ranged from 10.29 to 20.17 per cent, the refractive index from 49.2 to 54.2, and the Reichert-Meissl number from 25.9 to 33.7.

Annual report of the cheese making experiment station at Lodi, C. BESANA ET AL. (*Ann. R. Staz. Sper. Caseif. Lodi, 1906, pp. 106*).—In addition to a summary of the station work for the year the report includes articles on the chemical composition of milk from several localities, the character and composition of several soft cheeses, the action of lactic ferment in the manufacture of cheese, the control of milk, butter, and cheese through the initiative of the producer himself, the use of sheep's milk to add fat to skim milk used in cheese making, and on the milk industry at the international exposition at Milan, 1906.

Studies on the rational manufacture of grana cheese, C. GORINI (*Rev. Gén. Lait, 6 (1907), No. 15, pp. 337–345*).—A discussion of results obtained in continuation of work previously reported (E. S. R., 17, p. 802). In addition to laboratory work on the bacteriological flora of grana cheese, practical tests in the use of pure cultures in the making of cheese were carried on in an experimental cheese factory which, up to the middle of 1906, had comprised more than 300 pairs of cheeses. Tests on an industrial scale were also made in 15 regular cheese factories, which between July, 1906, and August, 1907, had made over 6,000 grana cheeses by the use of pure cultures, in accordance with the methods developed by the author. As this type of cheese requires long ripening, judgment regarding them can not yet be expressed in detail.

The ripening of Edam cheese (*Verslag. Ver. Exploit. Proefzuivelboerderij Hoorn, 1906, pp. 76–82; Centbl. Bakt. [etc.], 2. Abt., 19 (1907), No. 16–18, pp. 526–531, fig. 1*).—This has already been abstracted from another source (E. S. R., 19, p. 77).

Tubercle and typhus bacilli in kephir, C. W. BROERS and A. TEN SANDE (*Nederland. Tijdschr. v. Geneesk., 50 (1906), I, No. 25, pp. 1854–1857; abs. in Hyg. Rundschau, 17 (1907), No. 21, pp. 1276, 1277*).—In these investigations tubercle bacilli in milk from cows afflicted with udder tuberculosis resisted the process of making kephir from the milk, and remained so virulent that guinea pigs into which some of the kephir several days old was injected developed tuberculosis. Typhus bacilli in milk did not resist the kephir fermentation, being all dead after 48 hours.

On the practicability of milking machines, I. LINDSTRÖM (*Nord. Mejeri Tidn., 22 (1907), No. 36, pp. 424, 425*).—A paper read at a county agricultural convention in Sweden in August, 1907. The author is of the opinion that the present outlook as to the practicability of milking machines is promising.

Explanation of dairy machinery, L. MARCAS (*Ann. Gembloux, 17 (1907), No. 10, pp. 546–567, figs. 18*).—The author explains the purposes of various mechanical devices for different branches of the dairy.

The home bottling of fruit (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1907), No. 1, pp. 21–25*).—This article consists of instructions and recipes for bottling fruit intended for those who desire to preserve fruit in a small, economical, and satisfactory manner so that it may be available for home use when similar fresh fruit is not obtainable. It is claimed that "if the instructions given are carefully followed, fruit bottled as directed should keep sound for several years."

A theory of the extraction of sugar from massecuites, N. DEERR (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 20, pp. 29, figs. 3*).—The author states that "the object of this bulletin is to collect into an accessible form the data requisite for a systematic scheme of sugar boiling, and to establish some simple algebraical formulæ connecting purity of massecuite and concentration to which it should be boiled to obtain the best results. Incidentally the bearing of these results on the process known as 'crystallization in moton', and an apparatus known as the 'brasmoscope', are discussed."

Preservation of bags for storing superphosphates and sulphur (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 9, pp. 702, 703, pl. 1*).—A bag treated by soaking in a solution of red gum kino withstood for 6 months the action of a very acid superphosphate stored in it.

Distilling peat on a commercial scale, R. PIQUE (*Bul. Assoc. Chim. Sucr. et Distill., 24 (1907), No. 12, pp. 1730–1741*).—Data regarding the use of peat for alcohol making in different countries and the possibilities for this industry in France.

VETERINARY MEDICINE.

Results of investigations in the field of general pathology and pathological anatomy, O. LUBARSCH and R. OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere, 10, Sup. 2 (1907), pp. XIII+549–1182*).—In this supplemental volume a comprehensive review is given of the literature published during the years 1900 to 1905 on the pathological morphology and physiology of the organs of special sense. As in previous issues in this series, extensive classified bibliographies are given.

Immunity of the hibernating marmot to parasitic diseases, R. BLANCHARD and M. BLATIN (*Arch. Par., 11 (1907), No. 3, pp. 361–378*).—*Arctomys marmota* in hibernation appears to be absolutely immune to *Trypanosoma brucei* and *T. gambiense*, but this immunity is not prolonged beyond the period of hibernation. The immunity is not due to phagocytosis but to the low temperature of the body, and does not appear till about the ninth day of hibernation. The hibernating marmot is likewise immune to *T. lewisi* and *T. evansi*. The trypanosomes are not destroyed at once in the body of the hibernating marmot but persist for 4 to 9 days.

Similarly with trichina the marmot is easily infested in an active state but not in hibernation.

Bacterial agglutination with normal sera, E. BÜRGI (*Arch. Hyg., 62 (1907), No. 3, pp. 239–276*).—Agglutination experiments were carried on with a number of bacteria using the normal sera of man, guinea pigs, rabbits, dogs, cattle, horses, goats, sheep, and fowls. It was found that these sera could be arranged in series with respect to their agglutinating power toward bacteria.

Antibacterial action of the extract of tapeworms, C. JOYEUX (*Arch. Par., 11 (1907), No. 3, pp. 409–418, pls. 2*).—In the experiments reported in this paper *Bacillus mesentericus vulgatus*, *B. paratyphi*, and *B. psittacorum* were used. These bacteria were subjected to the action of the extract of *Tænia saginata*, *Moniezia expansa*, and *Thysanosoma giardi* in the proportion of 1 part worm pulp to 3 parts of water.

It appears that there is a reciprocal tolerance between the bacteria and the tapeworms. They may thus exist together in the intestines of the same animal without producing any interaction.

The production of leucotoxin, NAVEZ and ANTOINE (*Ann. Méd. Vét., 56 (1907), No. 8–9, pp. 444–463*).—The injection of a given variety of leucocytes into an animal causes the formation of a cytotoxin which is active toward the particular kind of leucocyte only. This is considered as indicating an independence of the different groups of leucocytes. The lymphocytes and mononuclear leucocytes apparently differ in origin from the polynuclear leucocytes. The nongranular leucocytes probably arise in the spleen and lymphatic glands. The destruction of a large proportion had no noticeable effect on the health of the animal.

Streptothrix in general, R. CAMINITI (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig.*, *44* (*1907*), *No. 3, pp. 193–208, pls. 4*).—A study made of *Streptothrix actinomyces*, *S. farcinica*, *S. violacea*, etc. In all 41 species are referred to this genus. In general the species of Streptothrix show great resisting power and persistence of vitality in cultures. Whether taken from cultures or directly from animals Streptothrix stains by the Gram and Ziehl-Neelsen methods. The species grow well under aerobic conditions. The pigment shows great variability. The growth of Streptothrix is slow as compared with that of ordinary pyogenic micro-organisms.

Notes from practice, M. LEIBENGER (*Wchnschr. Tierheilk. u. Viehzucht*, *51* (*1907*), *No. 32, pp. 621–626*).—Sarcoptic mange in horses was readily cured by the use of a 4 per cent solution of cresol. The author observed urticaria in a horse as a result of eating moldy oats, and symptoms resembling those of tetanus in a horse badly infested with Ascaris. *Mucor mucedo* on the feed caused serious poisoning in a horse.

Brief notes are also given on aneurism in pigs, tapeworms in dogs, and bleeding at the nose in cattle.

The farmers' veterinary guide (*Kansas City* [*1907*], *pp. 168*).—Short practical notes are given on the common diseases which affect horses, cattle, sheep, hogs, fowls, and dogs. The symptoms and course of the more important diseases are described and suitable remedies are recommended for the treatment of these troubles.

Veterinary service and meat inspection in 1905 (*Norges Off. Statis.*, *5. ser.*, *1905, No. 36, pp. 280*).—During the year under report there were observed 552 cases of anthrax, 2,116 cases of swine erysipelas, and various other diseases including blackleg, strangles, influenza, hog cholera, etc. No cases were observed of rabies, glanders, rinderpest, sheep pox, or swine plague. The work of eradicating tuberculosis was continued. The results of the findings in meat inspection are shown in tabular form.

Possibilities and limitations of veterinary science, W. T. KENDALL (*Jour. Dept. Agr. Victoria*, *5* (*1907*), *No. 8, pp. 448–490*).—Attention is called to the importance of veterinary inspection of stallions, veterinary control of horse breeding, horseshoeing, control of infectious diseases, and veterinary instruction in agricultural colleges.

Closed arthritis, CADÉAC (*Jour. Méd. Vét. et Zootech.*, *58* (*1907*), *Aug., pp. 451–471*).—Nontraumatic or secondary arthritis is due to indirect infection carried in the blood, or to the toxins produced by such general infections. Arthritis may result from glanders, strangles, tuberculosis, etc. Aside from the specific kinds of arthritis just mentioned septicemic polyarthritis of newborn animals and pseudorheumatismal arthritis of adult animals are the most important. These forms are described by the author and illustrations given. The pathology and treatment of arthritis are also discussed.

The treatment of lameness, GOLDBECK (*Illus. Landw. Ztg.*, *27* (*1907*), *No. 60, pp. 531, 532, figs. 5*).—The causes of lameness are briefly discussed, and notes are given on the results obtained from the use of different kinds of bandages and liniments.

Treatment of acute tympanites, E. J. DOMMERHOLD (*Tijdschr. Veeartsenijk.*, *34* (*1907*), *No. 10, pp. 595–597*).—According to the author tympanites occurs most frequently in the fall. In treating this trouble satisfactory results are more certainly obtained if the mouth of the affected animal is kept open.

Diseases of cows which are communicable to man, P. BERGÉS (*Bol. Soc. Agr. Mexicana*, *31* (*1907*), *No. 38, pp. 757–760*).—An account is given of the symptoms, pathology, and means of transmission of anthrax, actinomycosis, actinobacillosis, and mammary actinophytosis. The last-named disease has been observed only in Uruguay, where it affects about 1 in 1,000 cows. The pathology of the disease resembles that of tuberculosis.

Attenuation of the anthrax bacillus, H. Preisz (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig.*, *44* (*1907*), *No. 3*, *pp. 209, 210*).—Virulent anthrax bacilli form capsules in the animal body. Attenuated anthrax bacilli show swelling and liquefaction of the capsule on ordinary culture media. Nonvirulent forms may closely resemble in morphology the virulent bacilli but fail to form capsules in the animal body.

Vaccination of cattle against tuberculosis through the alimentary tract, A. Calmette and C. Guérin (*Ann. Inst. Pasteur*, *21* (*1907*), *No. 7*, *pp. 525–532*).—In a continuation of their experiments on vaccination against tuberculosis the authors found that the gravity of tuberculous infection in cattle, and probaby in man, depends on the number of bacilli absorbed, their virulence, and the frequency of repeated infections. Recovery may take place after a single infection even with a large number of bacilli, and is indicated by the absence of reaction to tuberculin. It confers considerable immunity toward subsequent infection, but it is impossible to state the exact duration of this immunity although in some cases it persists for at least 8 months. Further experiments are planned in exposing vaccinated cattle to natural infection from tuberculous cattle.

New reactions to tuberculin, P. Rubay (*Ann. Méd. Vét.*, *56* (*1907*), *No. 8–9*, *pp. 475–482*).—Details are given regarding 2 cases of tuberculosis in cattle which gave no reaction to tuberculin. In detecting this disease in man, it is believed that the ophthalmo-reaction is particularly well adapted on account of its very delicate and fleeting character. On the other hand, the cuti-reaction is decisive, of much longer duration, and is, therefore, recommended for use in testing cattle. It serves as a valuable means of control for the ordinary tuberculin test.

New methods for diagnosing tuberculosis, G. Moussu (*Bul. Mens. Soc. Cent. Agr. Hort. et Acclim. Nice*, *47* (*1907*), *No. 8*, *pp. 222-227*).—A description is given of the technique of the cuti-reaction and ophthalmo-reaction to tuberculin. The methods of cuti-reaction offers less difficulty than the ordinary subcutaneous injection of túberculin, and is fairly reliable.

The tuberculous nature of diffuse, hypertrophic enteritis of cattle, E. Liénaux (*Ann. Méd. Vét.*, *56* (*1907*), *No. 8–9*, *pp. 433–443*).—A protracted study has been made of a chronic enteritis of cattle.

Sheep and calves became infected by injection or ingestion of bacilli from cases of the disease, and showed a reaction to tuberculin within 19 days. On post-mortem examination the classic lesions of tuberculosis were found. Material obtained from such lesions and inoculated into guinea pigs produced pathological conditions identical with those of the bovine form of tuberculosis. Caseous necrosis of the liver and spleen was noted, and also serofibrinous lesions on the pleura.

The author holds that hypertrophic enteritis of cattle is a special form of bovine tuberculosis. The bacilli found in such cases are considerably attenuated.

Hematozoa of cattle in Indo-China, H. Schein (*Ann. Inst. Pasteur*, *21* (*1907*), *No. 8*, *pp. 659–665*, *pl. 1*).—In the blood of calves in Indo-China there is found a large Trypanosoma sometimes resembling *T. transvaaliense*. It does not infect animals other than Bovidæ. The blood of infected animals is virulent but the parasite is not always to be demonstrated. One infection confers immunity. The parasite is almost identical with *T. theileri*, and is most pathogenic in dry seasons when stock is badly nourished. The practical value of the discovery is that differential diagnosis can now be made between this disease and surra.

Souma, the trypanosomiasis of French Soudan, G. BOUFFARD (*Ann. Inst. Pasteur, 21* (*1907*), *No. 7, pp. 587–592*).—The author had opportunity to study souma in zebus, horses, asses, and mules. The disease occurs in acute and subacute forms. The blood parasite is sometimes found in the peripheral blood but is comparatively rare and nonmotile. Souma also occurs in sheep. The period of incubation is about 7 days. The pathogenic organism is *Trypanosoma cazalboui*, and is probably carried by *Glossina palpalis*. Benzidin causes the disappearance of the trypanosomes from the blood but does not bring about complete recovery.

Rôle of the spleen in trypanosomiases, A. LAVERAN and A. THIROUX (*Ann. Inst. Pasteur, 21* (*1907*), *No. 8, pp. 593–612*).—Experiments were made on guinea pigs and dogs with *Trypanosoma evansi, T. pecaudi*, and other species.

It was found that trypanosomes taken from the spleen during life or immediately after death were not to be distinguished from those in the general circulation. The extract of the spleen showed no trypanolytic action in vitro. The development of trypanosomes pursued a perfectly normal course in animals from which the spleen had been removed. It is believed, however, that the spleen assists in removing from the blood the remains of blood parasites during the progress of trypanosomiasis.

Some forms of spirochetosis met with in animals in India, A. LINGARD (*Jour. Trop. Vet. Sci., 2* (*1907*), *No. 3, pp. 261–286, pls. 3*).—An intense interest has lately developed in the study of Spirochæta. Careful distinction is made between Spirillum and Spirochæta, and in the author's opinion the family Trypanosomidæ includes the genera Spirochæta, Treponema, Trypanosoma, and Trypanoplasma. The literature relating to Spirochæta in animals and man is reviewed. Particular attention is given to the occurrence of these organisms as observed in India in Indian cattle, camels, horses, and elephants.

Hemorrhagic septicemia of cattle, and its relation to preventive vaccination, F. S. H. BALDREY (*Jour. Trop. Vet. Sci., 2* (*1907*), *No. 3, pp. 287–309, pls. 6*).—This disease is considered identical with barbone, pasteurellosis of cattle, etc., and has a wide distribution. The symptoms and lesions of the disease are described in detail. Hemorrhagic septicemia causes death by the rapid elimination of the toxin. The virulence of the organism is long retained in dust but is quickly lost in ordinary cultures, especially if exposed to light. The virulence is apparently diminished by passage through rabbits.

So long as the intestinal mucous membrane is intact, infection probably does not take place by feeding. Protective vaccination is possible by means of subcutaneous injection of the dead micro-organisms, but protective serum seems to exert little effect.

Texas or tick fever, C. A. CARY (*Alabama Col. Sta. Bul. 141, pp. 109–186, figs. 9*).—The history, etiology, and distribution of Texas fever are briefly discussed. When the number of red corpuscles affected by the blood parasite exceeds 1 per cent fatal results usually follow. It has been estimated that 300,000 ticks, a not impossible infestation of a single animal, would withdraw 200 lbs. of blood from the host.

An account is given of the life history of the tick, the symptoms, diagnosis, and pathology of Texas fever, and methods of producing immunity. Immunity to this disease, however, is merely relative. At the experiment station, 493 cattle have been inoculated with the result that the total percentage of deaths within 1 year after inoculation was 14.8.

Descriptions are given of the cattle tick and other related species. In Alabama the period of egg laying varied from 17 to 40 days, while the average length of life of ticks in summer and autumn was 22 days and of the larvæ in the fall and winter 6 months. An account is presented of the methods of eradicating ticks by the use of dips and the adoption of feed lot or pasture rotation systems. Several examples of rotations are presented. Directions are also given for the preparation of vats for dipping cattle and for the planting of Bermuda and other grasses in the improvement of pastures.

A copy is given of a new law establishing a State live stock sanitary board and the office of State veterinarian. The law provides that the professor of veterinary science at the Alabama Polytechnic Institute shall serve as State veterinarian. The live stock sanitary board is empowered to pass rules and regulations regarding the control of infectious diseases and the carriers of these diseases within the limits of the State.

Johne's disease, R. Paine (*Agr. Jour. Cape Good Hope, 31 (1907), No. 2, pp. 160–162*).—Chronic bacterial enteritis has been observed among cattle in Cape Colony but the disease is not widely distributed. The symptoms and pathology are described. Curative treatment is of little or no avail, but the spread of the disease may be largely checked by the observance of antiseptic precautions.

Cowpox vaccination as a protection against foot-and-mouth disease, T. Seibert (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 39, pp. 761–763*).—Preliminary experiments indicate that cowpox vaccine may be used to immunize cattle against foot-and-mouth disease. The author believes that the disease can be cured by using large quantities of the vaccine subcutaneously or intravenously.

False foot-and-mouth disease, L. Kantorowicz (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 6, pp. 550–555*).—The author reports the occurrence in cattle of stomatitis closely resembling foot-and-mouth disease and affecting the lips, udder, and hoofs. It is possible, however, to differentiate with certainty between these diseases by considering all of the circumstances surrounding a given outbreak.

Piroplasmosis of cattle in Tashkend and Russian Turkestan, I. Kowalewsky (*Jour. Méd. Vét. et Zootech., 58 (1907), June, pp. 330–345*).—For many years cattle in the neighborhood of Tashkend have been affected with a piroplasmosis which was carefully studied by the author. Detailed clinical notes are given on a number of typical and atypical cases of this disease. It is apparently caused by a form or variety of *Piroplasma bigeminum*. In certain cases lesions appear in the lips of affected animals, but this symptom was not constantly observed.

Experiments with serum against East coast fever, A. Theiler (*Jour. Trop. Vet. Sci., 2 (1907), No. 3, pp. 249–260*).—Healthy animals were repeatedly inoculated with large doses of virulent blood for the purpose of obtaining a cytolyctic serum. Occasionally this serum develops hemolytic properties. In the course of the experiments it was found that if immune animals be fortified with subcutaneous or intrajugular injections of defibrinated blood a serum is obtained which is hemolytic for cattle affected with East coast fever and destroys *Piroplasma parvum*. If immune cattle are similarly treated with blood from cases of East coast fever a serum is obtained which is neither hemolytic, microbicide, nor prophylactic.

It appears from these experiments that by transfusing large quantities of blood from a sick to an immune animal virus may be accumulated which may be used in fortifying cattle from which rinderpest serum is to be secured.

Preliminary report on the so-called stiff sickness or 3-day sickness of cattle in Rhodesia, L. E. W. Bevan (*Jour. Compar. Path. and Ther., 20 (1907), No. 2, pp. 104–113, figs. 2, charts 4*).—The symptoms of this disease include striking lameness and a general paralysis similar to that which appears in milk fever. As a rule, the animals begin to recover on the second or third day and the mortality is not greater than 5 per cent. There is usually a noticeable swelling around the eyes and an increased secretion of tears. The blood is somewhat altered in character, clots readily, and shows a tendency to collect in the pericardium. The lining of the abomasum is greatly inflamed. The cause of this disease has not been determined. When the blood of affected animals is inoculated into sheep a typical fever develops within 6 to 10 days, but the fever is not accompanied by stiffness.

Parturient eclampsia in the cow, H. TAYLOR (*Vet. Rec., 20* (*1907*), *No. 999, pp. 141, 142*).—Clinical notes are given on 3 cases of this disease observed by the author. It is considered to be very rare. The administration of aperients followed by bromid of potash brought about a cure in 2 of the 3 cases.

Enzootic retention of the afterbirth, H. HOLTERBACH (*Deut. Tierärztl. Wchnschr., 15* (*1907*), *No. 26, pp. 365-368*).—During the author's veterinary practice the number of cases of retention of the afterbirth in cattle has varied greatly in different years. Mention is made of four years in particular during which the disease appeared to an unusual extent. It was observed that in seasons when this trouble appeared most extensively in cattle, rachitis was also unusually prevalent among pigs and other young animals.

The author has come to the conclusion that the cause of enzootic retention of the afterbirth is to be found in an insufficient amount of lime in the food. In years of unfavorable weather it is well known that forage plants may not contain the same amount of mineral elements that they do when grown under more favorable conditions. Experiments in adding phosphate of lime to the ration indicate that this remedy will give favorable results. The author, therefore, recommends that phosphate of lime be added daily to the ration of breeding animals, especially during seasons unfavorable for the best growth of plants.

The organisms of calf dysentery and coli bacillosis, G. NEUMANN (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 44* (*1907*), *No. 3, pp. 213-223*).—Some races of calf dysentery bacilli are very virulent for guinea pigs, either by subcutaneous or intraperitoneal inoculation. Agglutination experiments failed to support the theory of the specific action of the coli bacillus in causing calf dysentery.

White-spot kidney in calves, V. FALLY (*Ann. Méd. Vét., 56* (*1907*), *No. 8-9, pp. 463-468, pl. 1*).—From a histological study of the phenomenon of white-spot kidney in calves the author comes to the conclusion that in the great majority of cases this condition is an interstitial nephritis with circumscribed foci. In some cases the white spots may be the remains of embryonic tissue.

Cœnurus serialis found in two goats in India, S. H. GAIGER (*Jour. Trop. Vet. Sci., 2* (*1907*), *No. 3, pp. 316-321, pls. 3, figs. 4*).—The normal host of *Cœnurus serialis* is the rabbit, and some interest, therefore, attaches to the fact that the author has found it in 2 instances in goats. The interrelations of the host and parasite are discussed.

The etiology of swine plague and hog cholera, R. OSTERTAG and A. STADIE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2* (*1907*), *No. 6, pp. 425-458*).—The numerous experiments reported by the authors in filtering the virus of hog cholera and swine plague have led to results which are at variance with those recently announced by Hutyra. In the experiments reported by the authors it was found possible to produce hog cholera with the filtered virus from animals simultaneously affected with hog cholera and swine plague. Intrapleural inoculation was in all cases more effective than subcutaneous.

In a parallel series of experiments it was determined that the virus of pure swine plague is not filterable, and also that the virus of the form of swine plague which commonly occurs as a complication with hog cholera is inactive after being filtered. Control experiments with unfiltered virus of swine plague produced the disease in all cases. Incidentally it appeared during these experiments that simultaneous inoculation with *Bacillus suisepticus* renders hogs more susceptible to infection with hog cholera.

Swine plague and hog cholera, E. Acosta and J. N. Dávalos (*An. Acad. Cien. Habana, 39 (1902-3), pp. 110-117*).—Brief mention is made of the occurrence of swine plague and hog cholera in the United States and Cuba. Both diseases are known in Cuba under the common name "pintadilla." A preventive and curative serum has been obtained by the method of the Bureau of Animal Industry of this Department.

Trichina inspection in various States of the German Empire, Rust (*Ztschr. Fleisch u. Milchhyg., 17 (1907), No. 12, pp. 410-423*).—The author presents in a tabular form details concerning trichina inspection in various parts of Germany. The table shows the authority for the first inspection, control inspection, fees, and other related matters.

Pulmonary lesions produced by Strongylidæ, A. Santicchi (*Arch. Par., 11 (1907), No. 4, pp. 621-641, figs. 9*).—The species upon which this report is based include *Strongylus arnfieldi* in horses, *S. micrurus* and *S. pulmonalis* in cattle, *S. filaria* in sheep, *S. paradoxus* in pigs, etc.

The lesions produced by Strongylidæ in the lungs of horses, cattle, and rodents are due to irritation. Adult parasites produce a bronchitis, eggs, and embryos inflammation and diffuse or lobular pneumonia. There is inflammation of the lung tissue with a varying degree of infiltration. Bacterial infection may arise secondarily. In later stages of infestation the author observed desquamation of the epithelium and turgor of the blood vessels. Small nodules may be formed, but they never become true tubercles. Objection is made to the use of the term "verminous phthisis." In some cases the verminous nodule assumes all the histological characters of tubercles, but infested animals do not react to tuberculin.

Fasciola hepatica in the parenchyma of the liver, K. Wolffhügel (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 2 (1907), No. 6, pp. 546-549*).—Brief mention is made of the occurrence of the liver fluke in the liver of deer and hogs. It is suggested that in many instances outbreaks of so-called enzootic hepatitis were merely cases of infestation with liver flukes.

Lesions caused by bots and Spiroptera in the stomach of the horse, G. Petit and R. Germain (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 16, pp. 405-417, figs. 4*).—From a histological study of lesions produced by bots the authors demonstrated cocci and other bacteria in the necrotic tissue. It remains somewhat uncertain whether the local necrosis is due to toxins secreted by the bots or to the secondary effects of bacteria. It appears that Spiroptera after penetrating into the submucous tissue secretes a toxin which causes necrosis and caseation.

Verminous adenoma in the horse's stomach, G. Petit and R. Germain (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 18, pp. 421-427, figs. 2*).—Adenoma of the horse's stomach may be isolated or confluent. The histology of such forms of adenoma is described. In some cases adenoma is caused by the presence of *Strongylus axei* in the walls of the stomach. This parasite has been found in both the ass and horse.

The method of Pirquet in the diagnosis of equine and human glanders, H. Martel (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 16, pp. 381-397, figs. 5*).—Cuti-malleination gave positive results in human glanders even in chronic cases of 2 or 3 years' standing. Both cuti-malleination and opthalmo-mallenation of horses proved valuable in a large percentage of cases in the diagnosis of glanders in horses. The latter method is most difficult to apply. Although cutimalleination is reasonably accurate as a test for glanders the hypodermic injection of mallein remains the most reliable method.

Interpretation of the mallein reaction, R. RACCA (*Clin. Vet.* [*Milan*], *30* (*1907*), *No. 38, pp. 617–621*).—If the swelling at the point of inoculation is slight and of short duration and if the temperature reaction quickly disappears, the animal is to be considered free from glanders. If, on the other hand, the temperature shows an elevation of 2° C. and the local reaction persists for a day or longer, the horse is glanderous.

Infectious myelitis in the horse, J. VAETH (*Deut. Landw. Presse*, *34* (*1907*), *No. 73, pp. 585, 586*).—In cases of infectious myelitis a preliminary stage of emaciation persists for ½ to 3 months. Then the hind quarters suddenly become paralyzed, the rate of pulse and respiration is increased, and the temperature is elevated. The conjunctiva turns yellowish. The lesions are found chiefly in the kidneys, spleen, bones, and spinal cord.

The disease appears to be due to a diplostreptococcus. No satisfactory treatment has been devised.

An enzootic of cataract in horses, C. CUNY (*Jour. Méd. Vét. et Zootech.*, *58* (*1907*), *Aug., pp. 471–478*).—A description is given of an outbreak of cataract and keratitis among horses on a farm where no disease of the sort had previously been observed. The trouble was believed to be due to toxins of alimentary or bacterial origin.

The treatment of dourine, V. L. YAKIMOV (*Arch. Vet. Nauk* [*St. Petersb.*], *37* (*1907*), *No. 5, pp. 413–432*).—The trypanosomes of dourine were largely destroyed in the blood by the use of trypanrot whether administered hypodermically or intravenously. In some cases considerable inflammation was produced at the point of inoculation either in the muscles or in the subcutaneous connective tissue.

Dourine in the remount depot at Constantine, MONOD (*Bul. Soc. Cent. Méd. Vét.*, *84* (*1907*), *No. 18, pp. 448–455*).—A stallion died of a chronic form of dourine without transmitting the disease to any mares. Ocular lesions appear in chronic dourine. A stallion may be infectious for a long time before recognizable symptoms of the disease appear. The temperature of suspected horses is not reliable for diagnosis.

A large dose of virulent blood is necessary to transmit the disease to dogs. Bovine serum sometimes brings about recovery, but iodid of potash, arsenic, cacodylate of iron or soda, and adrenalin are uncertain in their action.

Susceptibility of the Indian dog to dourine, H. T. PEASE (*Jour. Trop. Vet. Sci.*, *2* (*1907*), *No. 3, pp. 310–315*).—The pariah dog is not a good test animal in doubtful cases of dourine. The trypanosoma of dourine varied greatly in virulence, infection taking place in the dog in only one case. The organism multiplies at the point of inoculation, causing a local swelling, and attacking the lymphatics before causing a general infection of the blood. The trypanosome may sometimes be found in the infected lymphatic gland. A reliable test animal for the diagnosis of dourine is still to be found.

Post-mortem glycosuria in rabbits dead of rabies, S. A. GRYUNER (*Arch. Vet. Nauk* [*St. Petersb.*], *37* (*1907*), *No. 5, pp. 432–447*).—The urine of rabbits dead of rabies was found to contain 0.75 to 1 per cent of sugar. The sugar appeared in the urine whatever the source of the rabies virus used in inoculating the rabbits. Sugar was not observed in the case of any other disease and may, therefore, be considered a diagnostic mark of rabies.

Chicken pox, H. V. HAWKINS (*Jour. Dept. Agr. Victoria*, *5* (*1907*), *No. 7, pp. 389, 390, fig. 1*).—The symptoms of chicken pox are described from a recent outbreak observed by the author. For treatment of the disease a weak solution of permanganate of potash and a sulphur-borax ointment are recommended.

Diphtheria of fowls, Bordet (*Ann. Méd. Vét., 56 (1907), No. 8-9, pp. 494–498*).—The human diphtheria bacillus is found in fowls and the diphtheria antitoxin has no preventive effect on roup in fowls. Some fowls are refractory to the roup bacillus but inoculation of the nictitating membrane of the eye is always followed by a severe and characteristic reaction, edema of the eye and thickening and redness of the third eyelid.

A case of mycosis in a bird, S. Bonansea (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 24 (1907), No. 10, pp. 397–401*).—*Larus glaucus* was killed by spontaneous infection of the lungs with *Aspergillus fumigatus*. Brief notes are given on the lesions caused by this fungus.

The distribution of plague, C. Tiraboschi (*Arch. Par., 11 (1907), No. 4, pp. 545–620*).—An elaborate review is given of the evidence of the agency of small rodents and insects in carrying plague.

Rats are shown to be of great importance in the transmission of plague. The disease is also sometimes carried by mice. It has also been proved that fleas may carry plague from rat to rat, from rat to man, or from man to man. The chief species of fleas concerned in the transmission of plague among rats are *Pulex cheops*, *Ceratophyllus fasciatus*, *Ctenopsylla musculi*, *Ctenocephalus felis*, and *C. canis*. The same species and also *Pulex irritans* may carry plague from rat to man. The Sarcopsyllidæ seem not to be concerned in the problem.

The rôle of parasitic worms and insects in the transmission of pathogenic bacteria, M. Weinberg (*Ann. Inst. Pasteur, 21 (1907), No. 7, pp. 533–561, pl. 1, figs. 21*).—Most parasitic worms detach themselves from the intestinal walls almost immediately after the death of the host. The lesions caused by them can, therefore, be studied with ease. The author holds that the majority of parasitic worms favor the penetration of pathogenic organisms into the intestinal walls. Such penetration is effected in some cases in the punctures caused by the parasites, in other cases in the inflammatory areas or ulcers caused by the presence of the parasites. Thus Cestodes in attaching their sucking discs produce a congestion which enables bacteria to penetrate.

The larvæ of bots and similar insects may also cause alimentary ulcers. Septicemia may follow the attacks of parasitic worms.

Poisoning of animals, E. J. Dommerhold (*Tijdschr. Veeartsenijk., 34 (1907), No. 12, pp. 727–731*).—From cases which occurred in the practice of the author notes are given on botulism in dogs, lead poisoning in a cow, goat poisoning from *Taxus baccata*, toxic polyuria in horses, and mold poisoning of hogs.

Poisoning of cattle from Heracleum sphondylium, T. Bieler (*Chron. Agr. Vaud, 20 (1907), No. 18, pp. 428–434*).—A number of cases are reported in which cattle were poisoned by eating this plant in pastures. The symptoms were excessive salivation, convulsive movements, paralysis of the hind quarters, superficial cold, and moaning. The improvement of pastures is recommended as a means of preventing this trouble.

The larkspurs as poisonous plants, A. C. Crawford (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 111, pt. 1, pp. 1–12, pl. 1*).—The literature relating to the chemical composition and active principles of various species of larkspur is considered in connection with the author's investigations of this subject. In laboratory experiments on guinea pigs and rabbits, *Delphinium camporum* was used. When 5 gm. of a dried and powdered plant were extracted and dissolved in water to make up 30 cc., it was found that 4 or 5 cc. of this solution constituted a fatal hypodermic dose for guinea pigs of average size. It was found that the plant loses much of its poisonous property as it approaches the flowering stage.

Feeding experiments with rabbits showed conclusively that the plant is poisonous but there is a tendency for the rapid excretion of the poisonous principle through the kidneys. The urine of rabbits fed on larkspur was shown by tests on guinea pigs to contain the poisonous principle of the larkspur. Brief mention is made of antidotes which have been tested by various investigators in counteracting the effects of larkspur poisoning.

Experiments with inhalation of atomized solutions, A. FREUND (*Berlin. Tierärztl. Wchnschr., 1907, No. 31, pp. 575–580, figs. 2*).—A review is given of the literature relating to the inhalation of powdered, volatile, and atomized medicines in the treatment of live stock. The author used several kinds of apparatus for atomizing solutions. For this purpose methylene blue was chiefly employed. The experiment showed that the coarser the particles of medicine the less deep the penetration into the air passages and the nearer the nostrils they became deposited. Very finely atomized solutions penetrate into the pharynx, trachea or even into the finer bronchi and alveoli.

Radioscopy of pulmonary lesions in the horse, H. MARTEL (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 16, pp. 398–404, figs. 7*).—Illustrations are given of the value of the radioscope in diagnosing pulmonary diseases. By this means parasites such as flukes, Filaria, and Sclerostomum may be detected and also the lesions of glanders and broncho-pneumonia.

The use of suprarenal glands in the physiological testing of drug plants, A. C. CRAWFORD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 112, pp. 32*).—In the standardization of drugs the physiological test is recognized as being of the greatest importance. The author proposes to study the action of ergot, and since ergot is to be standardized against a known preparation of adrenalin it is necessary first to standardize adrenalin. The extensive literature relating to this subject is critically reviewed. The increase of blood pressure after the administration of adrenalin has been carefully studied.

It appears that the lethal dose of adrenalin for frogs is more than 0.5 mg. per kilogram. Guinea pigs are killed by subcutaneous injection of 0.01 gm. per kilogram, and rabbits by 0.02 gm. per kilogram. Adrenalin causes death by pulmonary edema and interference with the cardiac action.

RURAL ENGINEERING.

Lining of ditches and reservoirs to prevent seepage losses, E. MEAD and B. A. ETCHEVERRY (*California Sta. Bul. 188, pp. 385–420, figs. 15*).—Measurements made for this Office on a large number of ditches show an average loss on main canals of about 1 per cent of the water entering the ditches for each mile of ditch, while measurements of laterals show losses as high as 10 or 12 per cent per mile. The prevention of such losses is the object of the experiments in lining ditches and reservoirs carried on in California in cooperation between this Office and the California Experiment Station, the results of which are given in this bulletin.

The bulletin contains descriptions, with specifications and costs, of ditch linings in use in California, and the results of a series of experiments to determine the efficiency of various linings. The linings used were cement concrete, cement mortar and cement plaster, cement lime concrete, clay puddle, and road oil in different quantities per square yard of surface. The ditches were filled each morning and the rate of subsidence of the water was measured and compared with the results from an unlined ditch alongside. The following table gives the comparative efficiencies of the various linings, the actual cost at which the work was done, and the estimated cost on a large scale:

Results and cost of various linings for ditches.

Description of lining.	Per cent saving.	Experimental cost of lining, per sq. ft.[a]	Estimated cost (in practice) of lining per sq. ft.[a]
		Cents.	*Cents.*
Cement concrete, 3 in. thick	86.6	8.3	7.5
Cement lime concrete, 3 in. thick	65.5	8.3	7.5
Cement mortar	63.3	3.88	3.25–3.50
Heavy oil, 3⅜ gals. per sq. yd	50.4	1.20	1.20
Clay puddle, 3½ in. thick	47.8	3.90	1.20
Heavy oil, 3 gal. per sq. yd	38.0	1.00	1.00
Heavy oil, 2¼ gal. per sq. yd	27.3	.77	.77
Thin oil, 2½ gal. per sq. yd	7.3	1.00	.80
Earth (no lining)	0.00		

[a] Excluding the preparation of the ditch

"While there is no doubt that cement concrete is the most efficient as regards seepage, it is also the most expensive, being more than six times the cost of the heavy oil lining (3⅜ gallons per square yard), which saves 50.4 per cent of the water which would seep were the ditch not lined. This saving with the concrete ditch is 86.6 per cent, or 1¾ times as large. Where water is very valuable there is no doubt but that the concrete ditch is more permanent and economical. But where the water is not so scarce and a little waste will do no damage, the expense of lining the ditch with oil may be justified, while a more expensive lining would be impracticable. . . . But . . . the advantage of lining a canal is not alone the decrease in seepage; other factors should be considered. . . . (1) The prevention of growth of vegetation is an important item and is quite an expense, when in most cases the ditch or lateral must be cleaned out several times during an irrigation season; (2) the resistance to scouring, on which depends the velocity which the water can be given; (3) the prevention of burrowing into the banks and bottom of ditches by squirrels and gophers.

"That oil will prevent vegetation and the burrowing of animals in the banks and bottom of the ditch is clearly shown by [an] example near Lemoore.

"That oil will prevent scouring to a great extent and will allow a much higher velocity of flow of water than the earth ditch may be expected when we consider its resistance to wave action at the Ivanhoe Reservoir, and the resistance of oiled roads to cutting under the action of running water. This toughness of oil lining was noticed in filling the experimental ditches each morning. When the water carried by the wooden flume discharged into each ditch through the gate it had a fall of at least 1 ft. It was difficult to prevent the sloping ends of the earth and puddle ditches from being badly cut up by the erosive force of the falling water. These ends had to be well protected with heavy canvas, and even then erosion could not be altogether prevented. The ditches lined with oil resisted the erosion and showed no cutting, although they were not protected with canvas. . . . This resistance to erosion will permit a saving of cross-sectional area due to the possibility of giving the water an increased velocity. The higher velocity will prevent the deposition of silt to a great extent and there will be a consequent decrease in the cost of operation and maintenance."

On the artificial irrigation of field crops, I. I. STRELTSEV (*Vycdom. Selsk. Khoz. Promuish., 1905, Nos. 41, 43; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 1, p. 78*).—The author sums up his observations during 6 years on the Government Kamensk Irrigated Field in the Bakhmut

District, Government Ekaterinoslav, on the influence of irrigation on the life of cereals.

Some of the main conclusions are as follows: (1) Too heavy soils should not be irrigated before the coming up of the seeds, since the crust forming after the irrigation hinders this process. (2) In the cultivation of root crops the careful mellowing of the soil between the rows is very important after irrigation. (3) Plants irrigated at the end of a period of drought give a poorer yield than plants irrigated at the beginning. (4) For summer cereals 2 irrigations are sufficient—before stooling and before heading—provided the weather during the vegetation period is favorable for growth; for winter cereals 3 irrigations are necessary—1 in the fall and 2 in the spring; and fodder plants—alfalfa, clover, esparcet, and root crops—as well as flax and hemp, require 3 to 4 irrigations. (5) The amount of water required for one irrigation fluctuates between 450 to 1,800 cu. ft. per acre, varying with the soil, plant, and weather.

Swamp and overflowed lands in the United States, J. O. WRIGHT (*U. S. Dept. Agr., Office Expt. Stas. Circ. 76, pp. 23, pl. 1*).—This circular describes the cession of the swamp lands of the United States by the Federal Government to the respective States within which the lands are situated; gives the results of a canvass from which it is estimated that there are in the eastern portion of the United States 77,000,000 acres of swamp lands that can be reclaimed and made fit for cultivation; discusses the fertility of wet lands and the cost of reclaiming them; gives some history of early attempts at drainage in this country; discusses the legal phases of organization for drainage improvements, the procedure to be followed in inaugurating the work, and methods of assessing and collecting the cost of the work; and compares the different State laws which have been adopted for this purpose. A map shows the distribution of swamp land in the eastern portion of the United States.

Thrashing by electricity, G. COUPAN and VUAILLET (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 7, pp. 637–642; abs. in Rev. Gén. Agron., n. ser., 2 (1907), No. 9, pp. 360, 361*).—Tests of efficiency and economy of electric power for thrashing wheat are reported.

RURAL ECONOMICS.

Is rural depopulation on the decrease? (*Braunschweig. Landw. Ztg., 75 (1907), No. 33, pp. 145, 146*).—This is a discussion of the question as applied to the whole of Germany, and the losses in population from rural districts for definite periods are given as follows: From 1882–1895, average annual decrease 209,000; from 1895–1900, 496,000; and from 1900–1904, 270,000. These figures are regarded as indicating no cessation of the movement of the people from the land to the cities, and it is claimed that this tendency, more than any imaginary conflict between large and small capitalists, is constantly augmenting the ranks of the proletarians in the large industrial centers of Germany.

The agrarian question in Ireland at the beginning of the twentieth century, É. BÉCHAUX (*La Question Agraire en Irlande au Commencement du Vingtième Siècle. Paris, 1906, pp. 472; rev. in Polit. Sci Quart., 22 (1907), No. 3, pp. 524–526*).—This book deals with the history of the agrarian movement in Ireland and its economic and social effects.

The author traces the development of the Irish land-tenure system from its origin to the present century and describes the efforts made by the British government to ameliorate the condition of Irish agricultural laborers, particular stress being laid on the law of 1903 which, as applied to agriculture, is characterized as a law of "social and economic reconstruction." The reason so many small farmers fail in Ireland is attributed to inability to secure more land on which to bestow their labor. This is regarded as the chief source of poverty among the Irish peasantry, the cause of emigration, the reason of agitation; and the solution of this problem, it is believed, lies in the creation of a peasantry who own their land and enough of it from which to make a good living.

The other factors which have entered into the improvement of agricultural conditions and which are briefly discussed are the agricultural organization society, cooperative associations, and the department of agriculture. The aims of these organizations are described and a review of the work thus far accomplished is also given.

Land ownership in Russia, K. RAPH (*Écon. Européen, 32* (*1907*), *No. 820, pp. 393–395*).—This is a discussion of the agrarian question in Russia with reference to the number and classes of the population owning the land.

Of a total of 395,192,443 acres owned in 1905, 101,735,343 acres, or 25.8 per cent, were owned by private parties, 138,767,587 acres, or 35.1 per cent, were owned by communes, and 154,689,513 acres, or 39.1 per cent, were owned by the government, the church, and other corporate bodies or institutions. The principal owning classes among private owners are the nobles, peasants, and merchants, who own 61.9, 15.1, and 15 per cent, respectively, of the land. Of the 90,500,000 peasants in European Russia in 1905, 73,500,000 were engaged in agriculture. Of this number 62,500,000 owned their land, while 11,000,000 were nonowners.

The condition of small farming in Russia, A. VON VILLKOFF (*Inaug. Diss., Univ. Berlin, pp 85*).—The author shows by statistics derived from reliable sources in 50 provinces of Russia that the condition of the small farmer has not improved, but rather has become worse since his emancipation in 1861.

Not only the condition of the agricultural industry as a whole but the social and economic life of the peasant class are described, and the causes of failure together with suggestions for the improvement of the condition of the small farmer are discussed. In the author's opinion the chief remedy is more capital, which is designated as "the new life of small farming in Russia."

Agricultural cooperation in Great Britain, R. A. YERBURGH (*Jour. Soc. Arts, 55* (*1907*), *No. 2862, pp. 1049, 1050*).—This is a paper read before the British Association at Leicester on the development of agricultural cooperation.

The problems to be solved by this movement are, according to the author, the limitation of the rural exodus and the rehabilitation of rural life. By cooperation farmers secure goods of guaranteed quality and purity more cheaply and thus decrease the cost of production, cheaper transportation rates through shipments in bulk, a larger share of the profit upon goods sold, better prices because of the production of more uniform grades of goods, and other benefits, such as the development of character and of the intellect.

Statistics are presented on the development of agricultural cooperation in Great Britain with particular reference to the Agricultural Organization Society. The number of affiliated societies reached 153 in June, 1907, with a membership of about 10,000, and a business approximating £450,000 for the year, which indicate decided gains over 1906 (E. S. R., 18, p. 786).

A new application of productive cooperation in agriculture, J. HITIER (*Rev. Écon. Polit., 21* (*1907*), *No. 3, pp. 207–221; Jour. Agr. Prat., n. ser., 13* (*1907*), *No. 20, pp. 616–618; Mitt. Deut. Landw. Gesell., 22* (*1907*), *No. 16, pp. 160–164*).—This article describes the cooperative associations of agricultural laborers in Italy and Sicily, and gives an account of the causes and results of the movement to April 30, 1906.

The associations, which are known as "affittanze collettive," or cooperative farms, arose as a remedy for the want of steady employment among farm laborers. An association composed of day laborers rents land and operates it either as a single farm under a manager or as individual allotments. Of 108 associations 25 belong to the former class and 83 to the latter, which is regarded as the more promising form of association. Statistics are presented of the membership in the most flourishing societies, together with the number of hectares cultivated and the value of products raised. As regards the furnishing of employment and the returns from the labor expended, the results thus far prove that the associations are highly successful, but where associations have a larger membership than number of lots, a system of permitting members to cultivate a lot for a short period of time is practiced, and this the author regards as a grave economic defect. As a means of overcoming this difficulty it is suggested that such associations rent more land or cut down the size of the lots in order to grant an allotment to each member. A bibliography is included.

Agricultural cooperation in northern Europe (*Agr. Mod., 13 (1907), No. 32, pp. 449, 450*).—This is a discussion of the development of agricultural cooperation in Norway, Sweden, Denmark, and Finland, the data being derived from reports made at a convention of farmers held at Christiania July 3-7, 1907.

The different cooperative societies of Sweden belong to a national federation which in 1905 included 609 organizations with 23,000 members and which sold products valued at $3,400,000.

Finland had in June, 1906, cooperative societies numbering 1,016 with 90,000 members and doing an annual business of $9,600,000. Of these societies, the most promising were the cooperative dairies, which numbered 266 with 22,000 members and a business amounting to $2,500,000, and the rural mutual credit banks, which numbered 147. The loans advanced to members in 1906 amounted to $150,000.

In Norway the societies are largely concerned in animal production, though cooperative dairies number about 850.

The finance of farming, P. J. HANNON (*Agr. Jour. Cape Good Hope, 31 (1907), No. 2, pp. 178-185*).—This is a paper by the superintendent of agricultural cooperation read before the Institute of Bankers, Cape Town, July 18, 1907.

The author sets forth the need of capital in agriculture for the purchase of seed, stock, implements, etc., the opportunities afforded in Cape Colony for the extension and improvement of the agricultural industry, and the existing means of securing finances for these purposes. While recognizing the advantages of state aid under certain circumstances, the author is of the opinion that the self-help principle by means of cooperative and mutual credit associations is of greater significance in promoting the welfare of farmers, leaseholders, and laborers. It is believed that the colonial banks could assist in this movement by granting loans through cooperative associations at a lower rate of interest than is customary to individual farmers, and that the banks would be justified in doing this because of the greater security thereby afforded.

State aid to mutual credit associations composed of poor laborers, whose only security is personal credit, is advocated.

California: Resources and possibilities, N. P. CHIPMAN ET AL. (*Ann. Rpt. Cal. Bd. Trade, 17 (1906), pp. 69, figs. 14, map 1*).—This report describes the fruit, farm, and other industries of California, gives statistics on the wealth production for the years 1905 and 1906 in comparison with similar data for preceding years, and includes a series of articles dealing with the possible development, educational progress and facilities, forests, climate, irrigation, and agriculture of the State. The average annual value of farm, garden, and forest products for the two years was $309,980,287.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 9 (1907), No. 12, pp. 89–94; Sup., pp. 95–102*).—Statistics and notes are given on the condition of crops and on the acreage, yields, value, and prices of agricultural products in the United States and foreign countries. The supplement contains in addition to crop reports the annual report of the Bureau of Statistics for 1906–7.

Imports of farm and forest products, 1904–1906 (*U. S. Dept. Agr., Bur. Statis. Bul. 52, pp. 58*).—Detailed statements of imports of farm and forest products, including the countries from which consigned, are reported. The value of farm products imported in 1906 was $554,175,242, as compared with $553,851,214 in 1905. The value of forest products imported in 1906 was $96,462,364, as compared with $92,680,555, in 1905.

Exports of farm and forest products, 1904–1906 (*U. S. Dept. Agr., Bur. Statis. Bul. 53, pp. 68*).—Detailed statements of exports of farm and forest products, including the countries to which consigned, are reported. The value of farm products exported in 1906 was $976,047,104, as compared with $826,904,777 in 1905. The value of forest products exported was $76,975,431, as compared with $63,199,348 in 1905.

Trade with noncontiguous possessions in farm and forest products, 1904–1906 (*U. S. Dept. Agr., Bur. Statis. Bul. 54, pp. 40*).—The value of farm products shipped from the United States to noncontiguous possessions in 1906 was $18,294,735, and forest products $1,809,356; while the corresponding values of farm and forest products shipped from the different possessions to the United States were $54,640,122 and $3,081, respectively. The data for 1906 are compared with similar data for the years 1904 and 1905, and the quantity, value, and destination of the various products are reported in detail.

Trade of consular district of Riga [Russia], for the year 1906, A. WOODHOUSE ET AL. (*Diplo. and Cons. Rpts. [London], Ann. Ser., 1907, No. 3915, pp. 36*).—This includes notes on the exports and imports of agricultural products in comparison in some instances with the whole of Russia. "There was a large increase in the imports of agricultural machinery and implements during the year."

AGRICULTURAL EDUCATION.

Farm practice, J. L. STONE (*Cornell Countryman, 5 (1907), No. 1, pp. 8–10, fig. 1*).—Details are given concerning the farm practice requirements for graduation from the four-year course in the New York State College of Agriculture. No university credits are given for the farm practice work, which is considered rather as an entrance requirement which may be disposed of at any time before graduation. Each student must secure not less than 60 points out of a total of 130, 10 points being allowed for experience in each item in the following list:

(1) Harnessing, hitching, and driving horses; (2) plowing and harrowing land and cultivating crops; (3) planting crops (drills, seeders, etc.); (4) harvesting crops (mower, harvester, corn binder, potato digger, etc.); (5) running thrashing machinery, ensilage cutter, wood saw, and feed mill; (6) orchard and fruit yard work; (7) trucking and market garden work; (8) milking and caring for cows; (9) manufacture of butter and cheese; (10) managing and caring for a flock of sheep; (11) managing and caring for a herd of swine; (12) managing and caring for a flock of poultry; (13) any other definite line of agriculture.

County schools of agriculture in Michigan (*Mich. State Supt. Pub. Instr. Bul. 24, pp. 11*).—The Michigan legislature of 1907 passed an act making it possible to establish county schools of agriculture, manual training, and domestic economy, and this bulletin contains a reprint of the law establishing these schools, together with general suggestions by the State superintendent of public instruction in regard to the organization of the schools, the course of study, and reference books.

The schools are to be under the direct control of county school boards consisting of five members, including the county commissioner of schools and four members appointed by the board of supervisors. The law provides that the course of study shall extend over two years and shall include instruction in the elements of agriculture (the soil, plant life, animal life, and farm accounts), manual training, domestic economy, and other related subjects, and that each school shall have a tract of land suitable for experiment and demonstration of not less than 10 acres. Short winter courses are also provided for. The State superintendent of public instruction, with the advice of the president of the Michigan State Agricultural College, is to have general supervision of all schools established and may prescribe the necessary requirements for the organization and maintenance of them and the qualifications of teachers, except that no person shall be eligible to the position of superintendent of any school who is not a graduate of a State agricultural college.

Agriculture for high schools, G. F. Warren (*Cornell Countryman, 5 (1907), No. 1, pp. 5-8*).—A discussion on the outlook for the introduction of agriculture into regular high schools and the establishment of special agricultural high schools, with suggested courses for regular high schools having three teachers, four teachers, or more than four teachers, and for high schools wishing to offer strong agricultural courses.

The Royal Agricultural High School at Portici—past and present, 1872–1906 (*La R. Scuola Superiore di Agricoltura in Portici nel passato e nel presente, 1872-1906. Portici, 1906, pp. 331, pls. 16, map 1, figs. 55, dgms. 30*).—This is a description of the Royal Agricultural High School at Portici, Italy, its equipment and other facilities, and its courses of study, together with a historical sketch of the institution from 1872 to 1906.

The rural school problem, B. M. Davis (*School Life, 1 (1907), No. 1, pp. 5, 6*).—This article contains a brief statement of the rural school problem. The writer thinks that the "most marked improvement in rural schools has been brought about, directly or indirectly, along the lines suggested by leaders in agriculture rather than by leaders in education." He notes experiments in the improvement of rural schools in Illinois, Iowa, and Canada and outlines briefly an experiment now being undertaken in a rural school by the departments of manual training and elementary agriculture of the Ohio State Normal College of Miami University.

The problem of forestry in the public schools, B. Shimer (*Proc. Iowa Park and Forestry Assoc., 6 (1906), pp. 78-84*).—In an introductory way the writer makes some criticisms of the so-called nature study in schools, consisting in reading from the works of nature-study writers who have allowed their imagination too free rein or in making meaningless measurements, drawings, and observations of leaves and other nature-study material. He then makes a plea for nature study having a more practical application and mentions elementary agriculture and forestry among the subjects which can be taught in this connection, without too much formality but in such a way as to furnish material for numerous accurate observations and interesting conclusions. In forestry he would have the children learn how to plant and care for trees;

how to protect them from fire, cattle, and other enemies, how to recognize different kinds of trees, and how to learn the uses of living trees for such purposes as shade, ornament, and shelter belts.

The education of the cottage and market gardener, T. S. DYMOND (*Jour. Roy. Hort. Soc.* [*London*], *32* (*1907*), *pp. 113–122, figs. 5*).—This is a discussion of methods and means of education in gardening in Great Britain partly in comparison with similar work in America. The author discusses the place of such work in horticultural colleges, rural grammar schools, and elementary schools, the training of teachers for such work, evening schools, higher rural schools, and other means of education.

In discussing the subject of nature study and school gardens the author states that he is familiar with elementary education in several continental countries, as well as in Canada and the United States, but "that in none of these does the cultivation of school gardens approach in excellence that in our own country." This statement he later modifies in discussing the nature-study side of gardening wherein "the teaching of gardening operations was as good as it could very well be," but a surprising ignorance was shown by the pupils concerning the principles underlying these operations. Continuing, he says "In America it is the reverse. There, as practical gardening, it is almost ridiculous; but as training the children to exercise their intelligence about the things that form their surroundings, and thus acquiring a knowledge of those surroundings, natural and industrial, which will be useful to them afterwards in rural life, it is far ahead of ours. The results are better. The boys as they leave school may have less skill and a smaller store of knowledge, but they are more mentally alert, have greater power of adapting themselves to circumstances, are more keen to use any facilities that present themselves for further education."

Home nature-study course, ANNA B. COMSTOCK and J. W. SPENCER (*Home Nature Study Course* [*Cornell Univ., State Col. Agr.*], *n. ser., 3* (*1906*), *No. 1, pp. 39, figs. 20*).—Suggestions are given for teachers desiring to carry on the fall work of the first and second year pupils as outlined in the Syllabus of Nature Study and Agriculture issued by the New York State Education Department. There are 12 lessons on birds, 5 each on the potato beetle and the sunflower, 4 on grasshoppers and crickets, 4 on the sweet pea, 3 on the nasturtium, 2 each on the squirrel, leaves, oaks, and chestnut, and 1 each on the beaver, cat, pansy, milkweed, autumn flowers, maples, and the peach, pear, and plum. The plan of the different lessons is to explain their purpose, describe the material needed, and outline the observations to be made.

One woman's child garden, MABEL P. DAGGETT (*Broadway Mag., 18* (*1907*), *No. 6, pp. 729–736, figs. 17*).—This is a popular account of The Children's Farm School in DeWitt Clinton Park, New York City.

Technical education for women and girls at home and abroad (*London* [*1907*], *pp. 64*).—This pamphlet contains a series of unsigned articles on how girls are trained in France, Switzerland, Germany, Italy, Belgium, the Manhattan Trade School in New York, and London. The training under consideration is largely technical or more properly trade school work in sewing, cooking, millinery, laundering, etc. The work of some of the more important schools in each country mentioned is described.

The school of agricultural home economics at Alzey, F. RYZIGER (*Ann. Gembloux, 17* (*1907*), *No. 9, pp. 497–502*).—This is a description of one of the German schools of agricultural home economics, its equipment and course of study. Other similar schools are found in Baden, Wurttemberg, Bavaria, Hesse-Nassau, Brunswick, Saxony, and Schleswig-Holstein, while in Berlin there is a higher school for the training of teachers for such institutions.

Report of the Society of Southern Industrial Classes, Norfolk, Va., October, 1907 (*Trustees John F. Slater Fund Occas. Papers, No. 12, pp. 25*).—This is the eleventh annual report of the Society of Southern Industrial Classes at Norfolk to the trustees of the John F. Slater fund and the General Education Board. It includes statements concerning the itinerant work among schools for negroes in cooking, carpentry and home gardening. This work was carried on by the superintendent, two assistants, 13 regular teachers, and 32 volunteer teachers. The total enrollment of pupils in this work was 3,247.

MISCELLANEOUS.

Seventeenth Annual Report of Wyoming Station, 1907 (*Wyoming Sta. Rpt. 1907, pp. 143*).—This includes the organization list, a report of the director on the history of the station and its work, a summary of the publications of the station during the year, a financial statement for the fiscal year ended June 30, 1907, reports of the agriculturist and horticulturist, the botanist, the chemists, the irrigation engineer, the animal husbandman, the agronomist, and the meteorologist, together with plans of the station work for the ensuing year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Experiment Station Work, XLIII (*U. S. Dept. Agr., Farmers' Bul. 309, pp. 32*).—This number contains articles on the following subjects: Ice for household use, culture and varieties of root crops, cowpeas and soy beans, silage from frosted corn, cooperation in marketing crops, incubation of eggs, causes of death of young chicks, snow for poultry, eradication of cattle ticks, and bacteria in cream.

Report on the work of the agricultural experiment station of the University of Jena for 1906 (*Ber. Landw. Vers. Stat. Univ. Jena, 1906, pp. 20*).—A summary of the work of this station for 1906 in fertilizer and feeding stuffs control, seed inspection, plant diseases, variety testing, fertilizer trials, and other lines.

Yearbook of the German Agricultural Association, 1907 (*Jarhb. Deut. Landw. Gesell., 22 (1907), No. 2, pp. 243-433*).—A report of the proceedings at the meetings of this association during 1906.

Report of public measures for the advancement of agriculture for 1906 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1906, pp. LXVII+659, figs. 13*).—This is the annual report of the commissioner of agriculture for Norway, with reports of the State agricultural agencies, the chemical and dairy control stations, and the agricultural and dairy associations, schools, and exhibitions, an account of the harvest in 1906, and a summary of average temperatures and precipitation during the year.

Report of the agricultural department of Sweden, 1905 (*K. Landtbr. Styr. Underdåniga Ber., 1905, pp. 452+VI*).—The report contains the usual accounts for the year of the weather conditions and harvests, and of the work of the various agricultural and dairy societies, as well as of the educational, experimental, and other public agencies for the advancement of agriculture in Sweden.

Report of the agricultural department of Finland, 1904 (*Landtbr. Styr. Meddel. 53, 1906, pp. 211*).—This report contains data as to the work during 1904 of the public institutions for the advancement of agriculture in Finland.

NOTES.

California University and Station.—The *California Fruit Grower* states that F. T. Bioletti has resigned as viticulturist to engage in commercial work. H. C. Holm is in temporary charge of the instruction in the zymological laboratory. It is intended to expend about $50,000 for improvements this spring at the new farm at Davis, and plans for several new buildings and a waterworks system have been adopted. A seed house and laboratory is to be constructed for the cereal investigations. About 20 acres are to be set to orchard fruits and an equal area to grapes.

Colorado College. The one-week courses in horticulture, which were successfully begun last winter, have been repeated at Delta, Hotchkiss, Grand Junction, Paonia, Montrose, and Cañon City. A minimum enrollment of 100 was required at each place, and a small fee was charged which defrayed a portion of the expense. A short course for farmers was also given at the college, January 13–18, which was well attended.

Connecticut College.—R. W. Stimson has resigned as president to accept the directorship of Smith's Agricultural School at Northampton, Mass. This institution is expected to open next year as an agricultural and industrial school of secondary grade. A farm has already been purchased, and buildings are to be erected in the near future.

Georgia Station.—A. M. Soule has been appointed an ex-officio member of the governing board, A. J. Smith has been succeeded by E. L. Peek, and Felix Corput has been reappointed. T. H. McHatten, a graduate in horticulture of the Michigan College, and post-graduate student at Cornell, has been appointed horticulturist, vice H. N. Starnes, whose resignation was recently noted. The department of animal industry has been divided, P. N. Flint, assistant husbandman, being given charge of the feeding and nutrition work. The work in dairying was retained by C. L. Willoughby, who was also assigned some work in animal diseases, and given leave of absence for 6 months for study at Cornell University. The station has recently built a circular silo of 50 tons capacity.

Hawaii College.—A series of evening lessons in horticulture and entomology has been arranged, and a preparatory course was begun February 3. The formal opening of the college will take place September 14, when 4-year courses leading to the degree of B. S. will be offered in agriculture, and civil, mechanical, and electrical engineering. Entrance requirements to these courses have been adopted, these being approximately equivalent to a high school diploma.

Illinois University and Station.—The general offices in the agricultural building are undergoing alterations to provide additional room and facilities. These are necessitated by the increase in the attendance of students and in the work of the station.

Purdue University.—The Farmers' Short Course, held January 13–18, was very successful, more than 1,100 farmers and their wives being enrolled.

Iowa College.—The extension department is carrying out an extended programme of short courses both at the college and at other points in the State, ten such courses being contemplated during the winter. One of these courses was held January 20-24, at Cedar Rapids, and was attended by about 300 men and 200 women. Prof. P. G. Holden was in direct charge of the work and was assisted by three instructors in farm crops, three in animal husbandry, and two in domestic science. The courses for men were so arranged as to give 4 alternate periods of 90 minutes each for instruction in farm crops and stock judging daily. The farm crops work was devoted largely to corn, including instruction on seed selection and improved cultural methods, with some attention to oats and wheat, drainage, and other topics. The work in animal husbandry consisted largely of lectures and judging practicums with horses and beef and dairy types of cattle. In the domestic science course there were lectures and demonstrations throughout the week on cookery, sewing, and other phases of home making. The business men of Cedar Rapids, who were responsible for securing the short course in that city this year, have already taken steps to incorporate an association to provide for similar courses annually.

Maine Station.—Miss Lottie E. McPheters has been appointed computer in connection with the breeding statistics in the corn and poultry investigations.

Massachusetts College.—The summer school of agriculture which was organized in 1907 and enrolled over 200 pupils, is to be continued this year from July 6 to August 14. The first four weeks are planned especially for school teachers and the final two weeks primarily for preachers, with courses in technical agriculture during the entire period, this arrangement affording opportunity for two-week, four-week, or six-week courses. Nineteen courses are offered, including agricultural pedagogy, high school agriculture, high school chemistry, soils and tillage, field crops, domestic animals, practical gardening, gardening investigations, trees and shrubs, floriculture, plant life, elementary plant physiology, bird life, insect life, nature study drawing and forestry, and lectures on the agricultural industry in New England, agricultural economics, and the social aspect of agriculture, besides field exercises, round-table conferences, excursions, etc.

Michigan College and Station.—R. S. Shaw has been made dean of the departments of agriculture, veterinary, horticulture, and forestry. George R. Schafer, now a graduate student at Cornell University, has been appointed research assistant in entomology, and S. L. Jodidi assistant chemist, their work to be entirely under the Adams Act.

Cornell University.—A notable departure in the college of agriculture is the substitution of professorships of farm crops, farm practice, soils, plant pathology, plant physiology, and plant biology (plant breeding) for the former department of agronomy.

In order that pedagogical unity may still be preserved the various professors are now associated into an unofficial committee or subfaculty for the proper coordination of the work. The management of the college farm has been intrusted, under the general supervision of the dean, to the professor of farm practice, with whom arrangements for land and other facilities may be arranged by other departments of the college as desired. The professor of farm practice is to give instruction in this subject, both by means of lectures and by laboratory work in the barns and fields.

Recent appointments include Edward R. Minns, as assistant farm manager and instructor in farm practice; Elmer S. Savage, as assistant in animal husbandry; A. C. Publow, as first assistant in cheese making; M. B. Cummings, as assistant in horticulture; Henry Jackson Moore, as gardener of the horticultural department; Walter G. Krum, superintendent in the poultry department; Burton W. Somers, assistant in poultry husbandry; Scott H. Perky, research assistant in rural economy; and A. J. Lamoreux, librarian.

A general reunion of agricultural students was held during farmers' week, February 17-22. The programme included special exercises, the State poultry institute, and meetings of the State experimenters' league.

North Carolina State Station.—An additional experimental farm consisting of about 300 acres has been obtained near Asheville, in the Swannanoa Valley, which will be used for the demonstration of crops now generally grown or believed to be suitable to the mountain sections of the State, and for determining the plant food requirements of crops on these soils.

S. C. Clapp has been appointed nursery and orchard inspector, and S. B. Shaw, at one time assistant horticulturist of the Maryland Station, has been appointed assistant horticulturist.

North Dakota College and Station.—The traction engine short course held at the college early in January was attended by about 400 young men, who were given practical work in operating and repairing traction engines and other farm machinery. During the past season 12 demonstration farms of from 20 to 24 acres have been operated under a State appropriation of $7,500, chiefly to show the advantages of crop rotation, clover growing, and the use of manures. About 2 acres were tile-drained as a further test of the feasibility of this practice in the Red River Valley. A seed house with root cellar, and a granary will be erected this summer, State appropriations of $10,000 and $6,000 being available for the respective purposes.

Ohio Station.—Dr. W. I. Chamberlain, of Hudson, has been appointed to the board of control, vice D. D. White, and John Courtright has been reappointed.

The message of Governor Harris to the State legislature recommended an increased appropriation for the station. The State Association of Millers and Grain Dealers desires experiments in milling and baking, and the State Dairy Association favors the establishment of a model dairy farm. The work of the station in forestry is summarized and highly commended.

Oklahoma College.—Press reports state that J. H. Connell, editor of *Farm and Ranch* and director of the Texas Station from 1895 to 1902, has been elected president to succeed Dr. A. C. Scott in June.

Oregon College and Station.—At a meeting of the board of regents, January 16, elementary courses in agriculture, mechanic arts, domestic science, and commerce were established. The standard of the degree courses was raised one year, and professorships were established in veterinary science and industrial pedagogy. The expenditure of $25,000 for improvements and equipment was authorized, part of this sum being for work in poultry husbandry and agronomy and for the construction of feeding sheds for the experimental feeding of beef cattle and sheep.

Washington Station.—At the suggestion of members of the station staff, the State convention of wheat growers, recently held at Pullman, adopted a plan for the organization of a seed breeders' association, similar in plan and scope to the Canadian Seed Breeders' Association.

Wisconsin University and Station.—The faculty has recently authorized a radical revision of the four-year course in agriculture by introducing agricultural studies into the first two years instead of confining these years to work in general science. A two-year course in agriculture is to be established, to be known as the middle course. The entrance requirements will be the same as for the four-year course, but the student will substitute distinctively agricultural subjects for German and mathematics. The course is designed for high-school graduates desiring a more thorough preparation for farm work than can be secured in the short courses. At least 6 months' practical farm experience is to be required before the completion of either the two-year or the four-year course.

Buildings have recently been completed for the departments of agronomy and agricultural engineering. The agronomy building, 48 by 96 ft., is a two-story and basement structure containing a large storage room for seeds and grains, a corn-curing room, in which seed corn is fire dried, a grain-sampling room, a large, well-lighted corn and grain judging room, and offices. The agricultural engineering building is 50 by 150 ft., three stories high, and contains three large testing laboratories, a cement laboratory, two drafting rooms, and several class, demonstration, and recitation rooms and offices. A large power elevator renders convenient the handling of heavy machinery. Both buildings are of fireproof construction, of reinforced concrete and brick, with tile roofs. The greenhouses of the department of soils have been entirely rebuilt the past fall, and are now available for purposes of instruction and research work. A new stave silo has been added to the facilities of the department of animal husbandry for the production of summer silage.

Enos Lloyd-Jones, of Spring Green, has been appointed to the board of regents, vice James Lloyd-Jones, deceased. W. R. Block, a graduate of the Illinois University, has been appointed assistant in farm engineering, and C. S. Knight, who resigned to accept a position as assistant in agronomy at the Kansas College, has been succeeded by George S. Hine.

The station is continuing its educational campaign against bovine tuberculosis, and is now holding post-mortem demonstrations at State and county fairs, farmers' institutes, and other gatherings of farmers. Animals which have been tested and found to react are exhibited, after which a post-mortem examination demonstrates the fact that the disease may be well advanced although no physical symptoms are apparent. In this way thousands of voluntary tests are being secured in all portions of the State, such tests being most frequently conducted by students in the various classes (long and short farmers' courses), who are given specific instruction in the manner of application of the test. Tuberculin is furnished free of charge on condition that a report of the test be sent to the station. An interpretation of the results of the test is then submitted to the owner, and reacting animals disposed of by the State Live Stock Sanitary Board. This movement has resulted in popularizing the tuberculin test very rapidly throughout the State, and from data already at hand it is very evident that the disease is rapidly being brought under control.

Experimental Farms Proposed for Congressional Districts.—At the eighteenth annual convention of the Trans-Mississippi Commercial Congress, held at Muskogee, Okla., November 19–22, 1907, a memorial to Congress was adopted requesting the establishment and maintenance of an experimental farm and forest station in each Congressional district, where practicable, in the States and Territories west of the Mississippi River, the land to be provided by the community free of cost to the Government. The memorial also provides that the land-grant colleges may establish and manage like farms and stations.

An Agricultural Commission for Cuba.—Provisional Governor Magoon, of Cuba, has appointed a commission of 14, headed by Rafael Fernandez de Castro, president of the Agrarian League of the island, to draft and submit a law for the amelioration of agricultural conditions in Cuba.

American Society of Agricultural Engineers.—At a meeting held at the University of Wisconsin in December, 1907, the American Society of Agricultural Engineers was organized, and officers chosen as follows: J. B. Davidson, of the Iowa College, president; F. R. Crane and C. A. Ocock, of Illinois and Wisconsin universities, vice-presidents; L. W. Chase, of Nebraska University, secretary; and W. McE. Nye, of Purdue University, treasurer.

The programme of the meeting dealt largely with the question of instruction in agricultural engineering in the colleges. H. W. Wiley, of Cornell University, discussed Courses in Agricultural Engineering That Should Be Offered, and H. M. Bainer, of the Colorado College, emphasized the need of research and experimental work. Other papers were given by W. Boss, of the Minnesota University, on Short Courses for Agricultural Students; P. S. Rose, of the North Dakota College, on Teaching a Course in Farm Motors; F. R. Crane, of the Illinois University, on a Course of Rural Architecture, and W. G. Hummel, of the Colorado College, on Agricultural Engineering Literature.

Other speakers included R. P. Teele, who discussed the irrigation and drainage investigations of this Office, and B. B. Clarke, of the *American Thresherman.* The next meeting will be held at the University of Illinios.

American Breeders' Association.—The fourth annual meeting of the American Breeders' Association was held at Washington, D. C., January 28–30, 1908. The meeting was in all respects the most successful yet held, both as to attendance and general interest. All sections of the United States as well as Canada were well represented, and there were many visitors at the various sessions. Two joint sessions were held with the American Carnation Society, which was also holding its annual meeting. On the final day both associations were received at the White House by the President.

The scope of the programme may be indicated by the following reports of committees: On Animal and Plant Introduction, by David G. Fairchild; On Animal Hybridizing, by W. J. Spillman; On Breeding for Meat Production, by Andrew Boss; On Cooperative Work in Animal Breeding, by W. M. Hays; On Cooperative Work in Plant Breeding, by A. F. Woods; On Eugenics, by David Starr Jordan; On Breeding Fur Animals, by Vernon Bailey; On Breeding Trotting Horses, by H. K. Devereaux; On Breeding Carnations, by Chas. W. Ward; On Breeding Forage Crops, by T. F. Hunt; On Breeding Forest and Nut Trees, by Gifford Pinchot; On Breeding Cereals, by L. S. Klinck; On Breeding Vegetables, by W. W. Tracy; On Theoretical Research in Heredity, by H. J. Webber; On Breeding Bush and Small Fruits, by N. E. Hansen; and On Breeding Poultry, by C. B. Davenport.

Papers and addresses were also delivered as follows: Methods Used by the Ayrshire Breeders' Association in Perfecting the Breed, by C. M. Winslow; Methods Used by the American Jersey Cattle Club in Perfecting the Breed, by J. J. Hemingway; Correlated Varieties, by E. M. East; Color Variation of Domesticated Animals, by W. E. Castle; Origin of the Modern Horse and Relationship to the Arabian, by Robert N. Sewell; Improvement of the American Thoroughbred Horse, by Jouett Shouse; Some Thoughts on Eugenics, by Alexander Graham Bell; Theory and Practice of Breeding Disease-Resistant Plants, by W. A. Orton; Breeding for Increased Hardiness in Trees, by Chas. G. Patten; Constancy of Mutants, and Origin of Disease Resistance in Plants, by H. L. Bolley; Breeding Cantaloupes, by P. K. Blinn; Improvement of Hops, by W. W. Stockberger; Field for Economic Plant Breeding in the South, by David Coker; Gaps in Our Knowledge of Heredity, by H. J. Webber; and Experiments in Corn Breeding, by George H. Shull. A large number of other reports and papers were submitted for publication in the annual report.

Resolutions were adopted by the association as follows: (1) Favoring the authorizing by Congress of an investigation by the Secretary of Agriculture of the question of plant and animal quarantine as a necessary basis and preliminary for the framing of National quarantine regulations in order to avoid unnecessary interference either with commerce or desirable importations; (2)

urging upon Congress, State legislatures, sportsmen's societies, and private parties the preservation of the American bison, various species of deer, mountain sheep, arctic foxes, grouse, pheasants, quail, and other mammals and birds, and the desirability of experiments to determine their wide use on lands not especially suited to domestic species, and also their value in the foundation of hybrid animals designed for wild and semidomestic conditions; (3) authorizing the secretary, on vote of the council, to offer reduced clubbing rates on annual dues to clubs, societies, and associations, and (4) authorizing the council to establish a magazine under the auspices, and as the property, of the association when in its judgment suitable financial resources are available.

The retiring officers were reelected, except that H. J. Webber was made chairman of the plant section, vice Charles W. Ward, who succeeded L. H. Kerrick, deceased, as vice-president.

Tri-State Grain and Stock Growers' Association.—The annual convention of this association was held at Fargo, N. Dak., January 14–17, and was attended by nearly 1,200 farmers from North Dakota, Minnesota, and South Dakota. Morning, afternoon, and evening sessions were held each day and were uniformly well attended. The first two days were given up largely to live-stock interests, the evening of the second day and two sessions of the third day to horticulture and forestry, the evening of the third day and two sessions of the fourth day to cereals and forage crops, and the evening of the fourth day to agricultural education. D. J. Crosby, of this Office, spoke in the afternoon of the final day on The Feasibility of Teaching Elementary Agriculture in the Public Schools, and in the evening gave an illustrated lecture on How Agriculture is Taught in the Public Schools. J. H. Worst was reelected president and Colonel Benton secretary-treasurer.

Central Zootechnical Station of the State of São Paulo, Brazil.—In a recent number of *Annales de Gembloux* H. Raquet gives an account of the establishment of the Central Zootechnical Station at São Paulo in 1906, for the purpose of making acclimatization experiments with different breeds of animals from foreign countries, cultural experiments with forage plants in the study of animal nutrition, instructing breeders in rational breeding methods, popularizing modern dairy methods, training competent farriers, and disseminating practical knowledge concerning the training and management of draft animals and the improvement of poultry.

The equipment of the station includes herds of horses and cattle and an experimental garden of about 495 acres for the cultivation of forage plants. The personnel of the station engaged in the work of instruction includes the director and assistant director, professors of dairying, zootechny and hygiene, and farriery, foremen of cultural experiments, dairying, stables, sheepfolds, and pigpens, and a farrier. The instruction is divided as follows: (1) Dairy school, (2) zootechnical school, and (3) farriery school, each offering a six months' course, the first three months being devoted to theoretical instruction and the remaining three months to practical work. Descriptions are given of the schools, together with their programmes of studies. Annual exhibitions are held at the station at which lectures and practical demonstrations are given.

Agricultural Education.—Illinois College, Jacksonville, Ill., has recently received a bequest from the late Mrs. Phoebe G. Strawn of $20,000 for instruction in agriculture. The college will inaugurate this work during the present year by offering courses in soil fertility and fertilizers, soil physics, agricultural botany, and agricultural zoology. This work will be supplemented by occasional lectures by experts in agriculture. Dean Davenport, of the college of agriculture of the University of Illinois, gave the first lecture on The Relation of Agriculture to a System of Universal Education. C. G. Hopkins and F. H. Rankin will also represent the college of agriculture in the lecture course, and

C. A. Rowe will give a series of lectures on corn culture, breeding, and judging. In this connection it is interesting to note that Illinois college was the first institution to erect a building for higher education in Illinois, and that one of its early professors, Jonathan Baldwin Turner, was a leading spirit in securing legislation giving Government aid to land-grant colleges.

The Hamilton County High School at Tyner, Tenn., has introduced a course in agriculture and employed V. S. Bright as teacher of this subject.

S. L. Chesnutt, formerly teacher of agriculture at the Farragut School, Concord, Tenn., is now teaching agriculture at the Industrial School for White Girls at Montevallo, Ala. His successor at the Farragut School has not yet been chosen, but the agricultural work is being carried on with the aid of Prof. Josiah Main and others from the University of Tennessee.

The message of Governor Hughes to the State legislature contains a recommendation for the establishment of a secondary agricultural school in New York as a complement to the college of agriculture of Cornell University. It is suggested that there is a favorable opportunity for the establishment of such a school in connection with Alfred University, which, as previously announced, is now giving courses in agriculture.

School News for January, 1908, contains a description of the location, purpose, method of work, results of work, and future possibilities of the country training school of the Western Illinois State Normal School at Macomb.

The legislature of Alabama which adjourned recently increased the State appropriation for district agricultural schools from $2,500 to $4,000 annually for each school.

This year for the first time agriculture is made a part of the regular work of the eleventh grade in the high school at Pilot Point, Tex. The apparatus of the physical laboratory is utilized, supplemented by fruit jars, bottles, and other inexpensive material which can be used in laboratory exercises and experiments. The superintendent of the school writes that as a result of the introduction of agriculture the course in botany has taken on a more practical trend, and in fact "agriculture has given unity and purpose to the whole science course." The course in nature study is now being reorganized so that it will articulate with agriculture, and there will be progressive work with nature material all through the grades and in the high school.

The board of education of Pine Bluff, Ark., has introduced a three-year course in agriculture into the schools of that city. Instruction in agriculture was begun at the Missouri St. High School in September.

Two hundred students are enrolled at the Guthrie County High School at Panora, Iowa. A large percentage of these come from country schools in all parts of the county. The school employs a special teacher of agriculture and offers an agricultural course which runs parallel to a Latin course and a science course, agricultural subjects taking the place of Latin in the former, and of a part of the formal science work in the latter. The school has a separate building devoted largely to science and agricultural work, and is provided with some special equipment for agriculture, including a drying oven, soil tubes, and other inexpensive apparatus. A good-sized lecture room is used for class work in agriculture, and a well-lighted basement is utilized for farm machinery practicums, the classes studying gasoline engines, corn harvesters, manure spreaders, and mowing machines, which are loaned by manufacturers. About 50 boys are taking the agricultural course.

New Journals.—*L'Istria Agricola* has been established as the semimonthly organ of the agricultural institute, agricultural council, and forest commissioners of Istria, Italy. The initial number gives special attention to wine making.

L'Agricoltura Coloniale has been established as the monthly organ of the Italian Colonial Agricultural Institute, and the Office of Agricultural Experimentation, of Eritrea, Africa. The scope of these institutions and of the journal are set forth in the initial number, the purpose being to acquaint intending emigrants from Italy with the existing conditions in various agricultural sections of the world. An account is given of sisal culture, the production of rubber, cotton growing in Eritrea, the sugar convention in Brussels, and miscellaneous articles and notes.

The *Long Island Agronomist* is being issued by the Long Island Railroad Company as a "fortnightly record of facts" derived from the company's demonstration farms at Wading River and Medford, N. Y.

Miscellaneous.—Eduard Buchner, professor of chemistry at the Agricultural High School of Berlin, was recently awarded the Nobel prize in chemistry for investigations in bacteriology, especially the enzyms of fermentation.

Breeders' Gazette for January 8 contains an interesting illustrated account of the feeding work at the Indiana Experiment Station with the carload of short-fed cattle which received first prize in its class at the International Live Stock Exposition.

Revue de Viticulture contains a notice of the death, on November 7, of Dr. G. Delacroix, director of the Station of Vegetable Pathology of the National Agricultural Institute, Paris. A recent number of *La Semaine Agricole* states that Edouard Prilleux, honorary inspector-general of agricultural instruction, has been appointed to succeed him, and that Edouard Griffon, of the National School of Agriculture, Grignon, has been appointed assistant director.

An account of the work of Prof. Lucien Marcus Underwood, who died November 16, 1907, at Redding, Conn., at the age of 47 years, appears in *Journal of the New York Botanical Garden* for December. Professor Underwood's work was chiefly on ferns, but some attention was also given to fungi. He was biologist at the Alabama College and Station from September 1, 1895, to August 1, 1896, and published a number of articles on economic fungi, the treatment of fungus diseases, and other subjects as bulletins of that station.

Wiener Landwirtschaftliche Zeitung states that Ludwig Thais, assistant at the Royal Hungarian Seed Control Station at Budapest, has been appointed director of the station at Kassa, and that F. C. Dörre has retired as director of the Agricultural Academy, Tetschen-Liebwerd, Austria.

Prof. Karl Fruwirth, of the Agricultural High School at Hohenheim, has been appointed honorary lecturer in agriculture and forestry at the Royal Imperial Technical High School at Vienna.

La Tribune Horticole announces that Alphonse Dachy has been appointed director of the School of Arboriculture at Tournai, Belgium.

An International Congress of Refrigerating Industries will be held in Paris, in July, 1908, for the purpose of bringing together experts and representatives of the various industries and enterprises in which refrigeration is used to preserve food materials for transportation.

The Ceylon Agricultural Society reports that a new experimental garden is being started at Bandaragama under the auspices of the Rayigam Korale branch of the society.

Cornell Countryman for January, 1908, gives a brief description of the instruction in agriculture at the Waterford (Pa.) High School.

The December number of *Agricultor Mexicano* gives an account of the work of the Agricultural School at Ciudad Juarez, Chihuahua, Mexico, for 1907.

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EXPERIMENT STATION RECORD.

VOL. XIX. MARCH, 1908. No. 7.

The large and increasing number of changes in the personnel of the experiment stations has been a frequent matter of comment. These changes are recognized as a serious detriment to the work in a variety of ways, and have been generally deprecated. But they continue to go on and have become in a sense a feature of our American system. They are evidently more prevalent here than in other countries, due in part, doubtless, to the rapid development and extension of investigation, and to the openings in commercial lines for agricultural experts. They are in harmony with a national characteristic often ascribed to the American people, and may perhaps be accounted for in part by that trait.

At all events, the shifting of men from place to place is a product of our conditions and indicates a situation which is becoming more serious each year. While it is recognized that there have been extenuating circumstances during the past year and a half, it is a serious question whether these unstable conditions are not attributable to some extent to the general policy and spirit which have pervaded our stations. This seems a fair question in view of the failure to secure greater permanency with the passing of years, despite the elimination of factors which were formerly adverse to it.

The past year, with the search and competition for men incident to the inauguration of Adams fund work, was naturally—or at least under our conditions expectedly—a season of unusual change. The extent to which it has taken place is shown by an analysis of the organization lists of the stations, just issued, and comparison with the lists of a year ago. Of the men put down in the organization lists for 1907, no less than 168 are found to have changed their positions during the year. A few have gone out of the work entirely, but most of the number have moved on to other institutions. The enumeration takes account only of the scientific staff proper, omitting clerks or officers of the boards of control, and does not apply to the quite large number of new officers who have been added, to man new departments or extend those already existing. In other words, 168 men who were in the station work at the beginning of 1907 changed their positions or went out of the work during the year. This change affected all of the stations except three—Nevada, Tennessee, and Vermont. The number in the case of different stations ranged from one to eight persons; at fully a dozen stations there were five or more positions vacated.

Many of these changes were naturally of men in the assistant grade or occupying relatively subordinate positions. Such positions are usually regarded as more or less temporary, and changes in them are to be expected. But it is noteworthy that of the total number affected sixty-four were heads of important departments engaged in independent lines of work. If to this is added the fact that during the fiscal year 1906–7 there were changes in the directors of fourteen stations, it will be seen how serious the interruption necessarily was to the work and the permanent policy of the stations.

In one station the director, horticulturist, entomologist, agronomist, and dairyman all changed during the year; at another the director, agronomist, and animal husbandman; at another the director, agronomist, mycologist, and assistants in charge of animal husbandry and of plat experiments; at another the director, agronomist, dairyman, poultry expert, and three assistants; and at still another the director, animal husbandman, entomologist, cotton specialist, and three assistants. In several instances nearly the entire staff was wiped out by this drain from other institutions, and had to be renewed. One station lost its chemist (and assistant), bacteriologist, horticulturist, and agronomist; another lost its chemist, botanist (and assistant), animal husbandman, and several experienced assistants; and another its botanist, entomologist, veterinarian, dairyman, and two assistant chemists. The chemist, plant pathologist, horticulturist, and several experienced assistants of one station all changed during the year; the horticulturist, bacteriologist, and three assistants of another, and the animal husbandman, horticulturist (and assistant), animal breeding specialist, and several other assistants at another.

Thirty-four of the stations lost at least one head of an important department who was in charge of independent work.

These are rather startling facts. More than a quarter of the stations have had a change of management in the form of a new director; two-thirds of them have had changes in the heads of one or more important departments; and in at least a dozen cases more than half the working force above the assistant grade has moved on to new positions.

It requires little imagination and no very intimate knowledge of station work to realize the serious interruption and detriment which this is bound to cause. In many cases important lines of work have been started at considerable expense, which it was planned to continue over a term of years before definite results could be expected. With the change this work is often, and as a matter of fact usually, dropped.

The new man when he is found prefers another line of experimentation, and little can be expected if he is forced to continue an old line against his will. The man who originated the plan seldom starts it anew at his next location, for however good his intentions may be, he finds himself surrounded by a new environment which presents new problems and interests.

This is seen every year in going about among the stations. Lack of continuity is one of the greatest weaknesses of the American stations. It has cost thousands of dollars, from which there has been little or nothing of real final value. The failure to carefully plan and to follow out definite undertakings has probably done more to impair the efficiency of our stations than any other thing. In large measure it is a product of unsettled conditions, in which the personal factor is especially prominent. The qualities which make for continuity and persistency of effort are very essential traits in the station worker. These important elements in a station's work are inseparably bound up with permanency of the personnel.

The lack of continuity is even more serious when it comes to the class of investigations which the stations have been outlining and inaugurating the past year. In these the human element is especially prominent. Frequent changes are fatal to anything worthy to be called research. The man who has conceived an investigation is peculiarly a part of it and is well-nigh essential to its conduct. There are usually difficulties in his transplanting his projects when he makes a change of base. Thus far the losing of the leader has nearly always meant the abandoning of the project. As time goes on this is bound to be a serious handicap to our investigation unless some means is found for securing greater permanency in the human equipment.

It is difficult to determine how much of this change of location is legitimate and within the bounds which must reasonably be expected. Considering the tendencies of men, their tastes, and their natural desire to improve their conditions, a certain amount of shifting seems inevitable until they find their place and their work. But there have been other factors which have materially aggravated the situation.

Formerly the most frequent cause of change was instability of the positions and the practice of annual election of the station staff. This lack of permanency in the positions was a serious hindrance to the efficiency of the men as well as to the continuity of their work. It destroyed their peace of mind and made them uneasy to get into more settled surroundings. Now, happily, there is little cause for complaint on that score. Cases are very rare in which efficient and capable men are dropped from the station rolls without cause, and security may be said to be as great as in the better type of educational institutions.

The condition in this regard is now reversed, and men have become less permanent than their positions. It has sometimes been claimed that the ethical rights of the institution are now less carefully guarded than those of the men occupying positions in them. There have been resignations at critical stages in the station work or at inconvenient times of the year, at such short notice as to embarrass the station and interrupt its work. There is a nice ethical question involved here, as there is also in the practice of stations in drawing men from one institution to another without considering the interests of the institution affected.

Another drain upon the ranks of station men in the past has grown out of the rapid development of the National Department of Agriculture, and the building up of a large force of workers at Washington. With respect to the past year it is found that only seven heads of departments in the stations joined the forces of this Department, whereas three Department men went to fill important vacancies in the stations. Evidently, therefore, but little of the change of the past year can be attributed to that source.

The inequality of conditions at different institutions, and the differences in respect to those qualities which contribute to the desirability of positions, is without doubt the greatest cause of change. There are differences in standards and in general policy, and in the attitude toward the station work and the men, which count for much. These things, with the general atmosphere and spirit of the institution, largely determine the desirability of positions and the kind of service which can be expected of the men.

It is natural that scientific workers should seek congenial and inspiring surroundings, and positions which carry with them opportunity. The ambitious man will usually be open to a change of location until such conditions are found. The weight of the latter consideration—opportunity—is often underestimated by boards made up of practical men. With respect to it the greatest diversity is still found, despite the general improvement which has taken place.

Men at certain institutions teach from eighteen to twenty-five hours a week, attend to correspondence on practical questions, write extension bulletins, and do what station work they can in the scattered time that is left. They find little realization of the fact that investigation is an engrossing and time-consuming pursuit, not to be carried on in the leavings of time when the day's task of instruction is finished. At another class of institutions the time of the workers is conserved; their teaching duties are arranged so as to present the least possible interruption to their work, and they are encouraged to make the most of themselves. Their duties are made congenial as far as circumstances permit, and they are made to feel that in their efforts they have the thorough support and cooperation of the station authorities.

How different is their position from that of the man who must drop all else and go out for a farmers' institute campaign of indefinite duration, regardless of his tastes or conveniences, or take on the teaching of a short or summer course in addition to his other duties, leaving his work to take care of itself. Equipment and facilities for work differ greatly, as does also the attitude toward the purchase of needed supplies and apparatus and the meeting of other requirements. In some instances the question seems to be not as to what are the legitimate needs of efficient work but how little the man can get along with.

There is no question that the atmosphere and spirit surrounding different institutions varies greatly. Positions at certain institutions carry with them a standing among men; there is an *esprit de corps* which binds the men together and to the institution, and develops a scientific spirit. There is mutual pride in the institution, an appreciation of the success of individuals, and a satisfaction and contentment which make for permanency. Such an atmosphere is more likely to be found around older institutions, but is not confined to them. Its development is worthy of considerable effort on the part of those in charge. A great deal can be done by the trustees, the head of the institution, and the individual members of the staff to develop this atmosphere, to dignify the positions, and to surround the institution with a spirit of research.

Such conditions make the monetary consideration less dominant if none the less desirable. The latter is not without influence, but to a large body of men who have passed the assistant grade it is not alone the determining factor. Already a considerable body of station men has developed who are actuated by high ideals, and to whom opportunity and congenial atmosphere appeal even more strongly than salary. These men do not look for large monetary rewards in the pursuit of science, but they have demands upon them which grow out of their position and the tastes of culture and refinement, and they can look only to their salary to meet future as well as present needs.

Most ambitious and zealous workers are not indifferent to appreciation. The call to another institution is a recognition of ability, and as such is an honor to the man as it is also to the institution which has selected him and given him opportunity to develop as in him lies. But it is too often looked to as the only means of securing recognition of a man's position and usefulness. The salaries in some stations are far too low, and have not kept pace with the increased expense of living or the general tendency toward more adequate remuneration. A long period of satisfactory service should in itself bring with it advancement, without the lever of an offer from another institution. The attitude of the institution to the man should leave no doubt that he and his work are as highly appreciated at home as by any other institution.

There is a certain amount of change of position which is undertaken too hastily, and is of doubtful advantage to the man himself. No man can be blamed for seeking a larger position, or one offering greater opportunity or more congenial surroundings. But it is well to be sure that these seeming advantages actually exist, and are not due to a too roseate view due to imperfect knowledge of the new conditions. It is not very unusual to hear a man say in commenting upon his change of position, that he probably made a mistake, for the advantages which seemed to be offered by the new location were offset by conditions affecting his work—not always ascribable to the institution itself—which he had not fully realized. The advantages which already exist and the inevitable lost motion from a change of location are not always fully taken into account. There is almost certain to be a temporary disadvantage in a change, and at best the experiment usually has an element of uncertainty.

In other cases the casual observer is frequently led to wonder what induced the man to make the change of position. There has been no evident benefit, unless it be a small apparent increase in salary which may mean no real increase under the new conditions, while to outward appearances there has been a sacrificing of present opportunity and future prospect. The habit of change and the search for ideal conditions are disconcerting, and have stood in the way of some men's ultimate success.

A rough census of the heads of departments who changed their positions during the past year shows that twenty-nine accepted positions apparently better in point of salary or more congenial as to work and surroundings, while sixteen either made no apparent improvement or only a slight monetary one, the change being to outward appearances one of doubtful judgment as far as the future of the men is concerned. Nineteen went out of station work, some to confine themselves to teaching and others into commercial lines where the financial reward usually promised larger.

The evident conclusion from these figures is that much the larger proportion of changes seem to have been advantageous to the men making them, either in point of position, congenial surroundings, or commercial considerations. They indicate, however, that fully one-fourth of the changes were of negative advantage from the present indications, and in several cases likely to prove a disadvantage as time goes on.

From the standpoint of the stations who lost men by the change, it seems clear that in over two-thirds of the cases, at a moderate estimate, the going of the men was a distinct detriment, to have been avoided if possible. The men referred to were heads of departments, who were furnishing the brains and the genius for the station's work. Just such men were needed as were allowed to go, and there were no apparent circumstances which seemed to call for a change. It has required much search to fill the places vacated, and not infrequently weaker or less developed men have had to be taken up with. In the end a higher salary has often had to be offered and other concessions made.

There seems little doubt that under the circumstances good policy and the general welfare of the stations would dictate that these changes should have been guarded against or avoided. The question naturally arises, Could they have been? This is, of course, difficult to determine absolutely; but from a detailed consideration of individual cases and a fairly intimate knowledge of the conditions surrounding different stations, it is believed that a quite large part of these changes were unnecessary and could have been prevented. In a considerable number of cases they were induced by a narrow view on the part of the institution—a false economy which fails to recognize the value of a man by meeting a slight increase in salary or removing uncongenial or burdensome duties. By making the positions more attractive in point of salary or opportunity or greater specialization of work, a feeling of satisfaction and contentment would have been promoted which would often have minimized the apparent advantages of a change, and a relationship of the man to his work might have been established that would have caused him to be slow to relinquish it.

Each experiment station has obligated itself to conduct a certain amount of investigation in agriculture, and to that extent at least it has just as great need of competent men as any other in the system. As far as the Federal funds go it has the same amount of money that the others have, and it is a grave mistake if this has been spread out over more departments than can be manned and maintained efficiently. Changes will be inevitable as long as the inequalities in positions continue to be as glaring as at present. Each station should therefore spare no reasonable effort to eliminate factors which are unfavorable to permanency and to hold its competent men, even at the expense of a somewhat larger salary and a possible readjustment of duties, recognizing that the human element overshadows every other consideration in experiment station work.

Carl von Voit, one of the most eminent physiologists of his time and a pioneer in the theory of nutrition, has died at the age of 76 years. Through a long period of activity he has been recognized as a leader and worker of unfailing energy and great ability, and a man of judicial temperament and fair-minded attitude, more interested in the discovery of truth than in the acceptance of any theory.

Born at Amberg, Bavaria, in 1831, Voit's university education in medicine, physiology, and chemistry was gained at the universities of Munich, Würtzburg, and Göttingen, where he came under the influence of Pettenkofer, Wöhler, and other eminent teachers. His ability was recognized from the first, and he was made Bischof's assistant at the University of Munich in 1856. In 1860 he was appointed professor extraordinarius in physiology, and in 1863 professor ordinarius and custodian of the physiological institute at the University of Munich, positions which he held until his death. Many honors came to Professor Voit in his long life. He was a privy councilor and a member of many learned societies.

Nutrition problems claimed Voit's attention from the first, and some of his most important contributions were in that field. It was through his efforts that the theory was developed and accepted that the measurement and analysis of the body excretory products furnishes data for judging of its metabolic processes. His earlier work, and much of his later, had to do with the renal excretion of nitrogen as a measure of protein metabolism. Of even greater importance is the measurement of carbon, and Voit was early associated with Pettenkofer in the development of the respiration apparatus which bears their names. With the aid of this appliance he and his associates studied the respiratory products and greatly added to the scope and value of investigations upon metabolism of man and animals. As a result of these and other investigations dietary standards were established, which have been of the greatest use in the discussion of problems pertaining to the proper nutrition of individuals and groups.

Although he was especially interested in problems of human nutrition, Voit's work has been very important in connection with the study of the related question of the proper nutrition of farm animals. The methods which he devised and perfected were applicable also to this line of research, and many of his investigations had a direct bearing upon these problems, as, for instance, studies of the formation of fat in the animal body, and the substituting value of protein, fat, and carbohydrates.

Voit was the inspiration of much of the American work on the general subject of nutrition. The late Prof. W. O. Atwater was a pupil and apostle of Voit, and was instrumental in adapting German experimental methods to American conditions. With his associates, he improved the respiration apparatus and greatly increased its usefulness by the addition of devices for the measurement of the income and outgo of energy.

In association with Buhl and Pettenkofer, Voit founded the *Zeitschrift für Biologie*, and always retained connection with this journal, to which he was a frequent contributor. His published writings are numerous and cover a wide range of topics. Many of them, notably the reports of experiments made with the respiration apparatus, have long been accepted as classics. In his Handbook of Physiology of General Metabolism and Nutrition, published in Leipsic in 1881, much of his earlier work is summarized and his theories expounded. It would be difficult to overestimate the influence of this volume on modern physiological thought.

Prof. Graham Lusk, a pupil of Voit, says of him and his work: "Voit was honored as among the highest in his own land, but he would have been a great man in any country. He was one of those spirits whose lives are the heritage of mankind. It only requires knowledge of his work to realize that his fame will grow greater as the years pass by."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Heat of evaporation of water, A. W. SMITH (*Phys. Rev., 25 (1907), No. 3, pp. 145–170, figs. 3*).—From experiments reported in full the author deduced the following formula for the heat of evaporation of water at temperatures between 14 and 40° C.: L(in joules)$=2502.5-2.43T$. "The probable error of values computed from this formula is 0.5 joule. These results are expressed in international joules; that is, in terms of the international ohm and 1.43400 volts for the E.M.F. of the Clark cell at 15° C." For comparison the results are also expressed in mean calories, assuming that a mean calorie is equivalent to 4.1887 international joules, which would make the formula L(in mean calories)$=597.44-0.580T$.

The data reported show that the same amount of heat is required to evaporate a gram of water whether the external pressure be great or small. A table is given showing the heat of evaporation of water from 10 to 45° C.

In calorimetric experiments with man and animals the heat evaporation of water at 20° C. is one of the factors used. This is given by the author as 2,453.9 international joules or 585.84 mean calories.

The quantitative synthesis of argentic nitrate, and the atomic weights of nitrogen and silver, T. W. RICHARDS and G. S. FORBES (*Carnegie Inst. Washington Pub. 69, pp. 47–65, figs. 2; Chem. News, 96 (1907), Nos. 2498, pp. 180–183, fig. 1; 2499, pp. 190–193, fig. 1*).—The outcome of these investigations was "that 100 parts of pure silver produced 157.479 parts of argentic nitrate. If, then, silver is taken as 107.93, nitrogen must be 14.037; or if silver is taken as 107.88, nitrogen must be 14.008, oxygen being 16."

A revision of the atomic weight of potassium, T. W. RICHARDS, A. STAEHLER, and E. MUELLER (*Carnegie Inst. Washington Pub. 69, pp. 7–44; Chem. News, 96 (1907), Nos. 2494, pp. 133–136; 2495, pp. 145–148; 2496, pp. 156–159; 2497, pp. 170–172*).—The authors conclude from the review of all available data that "there seems to be little reason to doubt that the outcome of the present investigation, 39.114, really represents the atomic weight of potassium." See also a previous account (E. S. R., 18, p. 1107).

Method for rapid measurement of carbon and hydrogen in organic substances, P. BRETEAU and H. LEROUX (*Jour. Pharm. et Chim., 6. ser., 26 (1907), No. 9, pp. 385–392, figs. 2*).—The authors describe an apparatus and method of procedure in which they have sought to combine various advantages that have been gained through the modification, by different investigators, of the classical method of Liebig for the measurement of carbon and hydrogen in organic substances.

Hydrolysis of excelsin, T. B. OSBORNE and S. H. CLAPP (*Amer. Jour. Physiol., 19 (1907), No. 1, pp. 53–60, pl. 1*).—The globulin excelsin from the Brazil nut, according to the authors, on hydrolysis showed no striking feature except the unusually large proportion of arginin (16.02 per cent) which was found. Full data regarding the percentage amount of the hydrolysis products are reported. The total material obtained by hydrolysis was 61.09 per cent.

Hydrolysis of hordein, T. B. Osborne and S. H. Clapp (*Amer. Jour. Physiol., 19 (1907), No. 1, pp. 117–124*).—Hydrolysis of hordein showed, according to the authors, that this constituent of barley "is characterized by marked differences in the proportion of its decomposition products when contrasted with the other proteins that have been thus far analyzed. Like the other alcohol-soluble proteins, it yields no lysin, relatively little histidin [1.28 per cent] and arginin [2.16 per cent], and much ammonia. The very large proportion of glutaminic acid [36.35 per cent] is practically the same as that obtained from gliadin. The most marked feature, however, is presented by the very large proportion of prolin [13.73 per cent], which greatly exceeds that yet obtained from any other protein, being practically twice as much as the relatively large quantity yielded by gliadin." The total material obtained by hydrolysis was 71.32 per cent.

Hydrolysis of legumin from the pea, T. B. Osborne and S. H. Clapp (*Jour. Biol. Chem., 3 (1907), No. 3, pp. 219–225*).—When the legumin of the pea was hydrolyzed with hydrochloric acid the percentage amounts of the constituents obtained were as follows: Glycocoll 0.38, alanin 2.08, leucin 8.0, prolin 3.22, phenylalanin 3.75, aspartic acid 5.3, glutaminic acid 13.8, serin 0.53, tyrosin 1.55, arginin 10.12, lysin 4.29, histidin 2.42, and ammonia 1.99, making a total of 57.43 per cent. Valin was not isolated, cystin was not determined, and tryptophan was present.

The proteins of the pea, T. B. Osborne and I. F. Harris (*Jour. Biol. Chem., 3 (1907), No. 3, pp. 213–217*).—A method which is given for the separation of the proteins of the pea, namely, legumin, vicilin, and legumelin, depends upon fractional precipitation with ammonium sulphate after extracting pea meal with 10 per cent sodium chlorid solution. The proteins obtained agree closely in composition and behavior with products previously separated by other methods.

Meat analysis under the German law of May 30, 1902, E. Salkowski (*Arch. Physiol.* [*Pfluger*], *118 (1907), No. 5–7, pp. 322–326*).—A controversial article on methods for the detection of horseflesh.

The identification of protein by biological methods in sausage inspection, G. Popp (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 1–2, pp. 33–35*).—In this paper, presented before the meeting of the German food chemists in May, 1907, the author discusses his method of applying a biological test, with special reference to the detection of horse meat in sausage.

The growth of the chemistry of culinary fats, W. Arnold (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 1–2, pp. 147–198*).—A summary and critical discussion of the progress which has been made in the examination of culinary fats, presented before the May meeting of German food chemists.

The tristearin content of beef and of mutton tallow, A. Bömer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 1–2, pp. 90–117, fig. 1*).—Analytical methods and other related questions are discussed in this report, which was presented before the May meeting of German food chemists.

According to the author, the so-called double melting point of the glycerids is due to the presence of two physical isomeric modifications, one labile and the other stable. The quantity of tristearin in beef and mutton tallow, the author states, is not so great as previous investigators have reported, the amount found being 1.5 per cent in beef tallow and 3 per cent in mutton tallow. A sample of commercial pressed beef tallow contained 4 to 5 per cent.

Investigations on foreign fats in lard, A. Leys (*Jour. Pharm. et Chim., 6. ser., 26 (1907), No. 7, pp. 289–300*).—Determinations of melting point, iodin number, and other physical constants are reported and discussed with a view to the detection of adulteration in lard.

Note on the determination of crude fiber, J. P. STREET and W. P. ALLEN (*New Jersey Stas. Rpt. 1906, pp. 65-67*).—The authors report analytical data, particularly concerning the amount of pentosans, ash, and nitrogen found in the residue from acid and alkali treatment by the official method for determining crude fiber in feeding stuffs, using mixed feed, alfalfa meal, cotton-seed meal, distillers' grains, and gluten feed. The variations obtained are considered too wide for a reliable quantitative method, and when it is taken into account further that the residues, particularly in the case of alfalfa meal, are contaminated with lignin compounds, the necessity for further work on the method of determining crude fiber is emphasized.

Buckwheat products. Proposed standards of composition, J. P. STREET (*New Jersey Stas. Rpt. 1906, pp. 67-70*).—On the basis of data gathered from buckwheat millers and other sources, the author classifies buckwheat products and proposes standards for them. The milling products, according to his classification, consist of the following:

"The flour, including the starch with as little as possible of the other layers.

"The middlings and bran, including varying proportions of the seed coat, the aleurone layer and more or less starch.

"The hulls, comprising the outer epidermis, the woody layer, the less-hardened adjacent layer and the inner epidermis.

"The feed, comprising the hulls and bran, with more or less of the outer hull removed."

The carbohydrates of sugar-beet pulp, J. P. STREET (*New Jersey Stas. Rpt. 1906, pp. 39-65*).—A thorough analytical study of dried beet pulp was undertaken to ascertain whether there is a relation between its composition and the results of feeding experiments previously reported (E. S. R., 17, p. 394) in which a somewhat higher yield of milk and butter was obtained with a ration containing unsweetened pulp than with one containing hominy meal, although the carbohydrates, commonly regarded as easily assimilated, had been largely removed from the beet pulp during manufacture. The results at present obtained are regarded as preliminary. The pulp was found to have the following percentage composition: Water, 9.86; fats, waxes, resins, and colors, 1.89; organic acids, 5.23; tannin, 0.12; reducing sugar, as *d*-glucose, 1.21; invert sugars, as sucrose, 7.10; pectin, 2.17; parapectin, 0.90; hemicelluloses, 16.16; araban, 19.61; lignin acids, 6.99; lignin, 6.21; galactan, 8.30; cellulose, 11.32; protein, 6.94; ash, 4.08; with 0.73 per cent undetermined. Six different modifications of araban and at least 3 of galactan were identified.

"The results obtained in this investigation raise doubts as to the advisability of attempting a quantitative determination of the various complex carbohydrates as individual compounds. For instance, in the beet pulp we have apparently six different modifications of araban and at least three of galactan. A determination of total araban or total galactan, in this material at least, would possess but relatively little significance. Furthermore, owing to the complexity of many of the carbohydrates it is by no means certain that a method applicable to one class of materials would be equally useful with others. It would seem, therefore, that with our present knowledge the more rational procedure is to separate the carbohydrates into groups, these groups to be based on their reactions with various solvents rather than on their chemical formulas."

The latest investigations on the subject of starch (*Pure Products, 3 (1907), No. 7, pp. 304-308*).—A summary and discussion of recent theories on the chemical structure of starch.

Rapid estimation of water in sugar-house products, such as sirups, massecuites, etc., H. MAIN (*Internat. Sugar Jour., 9 (1907), No. 106, pp. 481-487*).—The usual methods of estimating water in sirups by drying in sand, etc., are as the author points out, slow and unsatisfactory, especially if invert sugar is present. He states that he has obtained very satisfactory results by the use of the Abbe refractometer in determining the amount of water in sirups, etc., and describes the method.

Estimation of sugar in dried beet chips, J. G. SLOBINSKI (*Ztschr. Ver. Deut. Zuckerindus., 1907, No. 620, II, pp. 869-893, fig. 1*).—A study of methods.

The characteristics of wine extract as a means of judging wine, O. KRUG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 1-2, pp. 117-120*).—In the author's opinion, the physical character of the wine extract is of value in judging the quality of wine. His report was presented before the meeting of the German food chemists in May, 1907.

Vinegar and vinegar essence, T. W. FRESENIUS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 1-2, pp. 199-203*).—In a paper presented before the May meeting of the German food chemists, the author reports data on the determination of hydrogen sulphid and aldehyde as a means of judging of the quality of vinegar and vinegar extract.

Formic acid as a preservative, B. H. SMITH (*Jour. Amer. Chem. Soc., 29 (1907), No. 8, pp. 1236-1241*).—According to experiments on the effect of formic acid as a preservative, this material ranks lower than benzoic or salicylic acid as an antiseptic agent.

"One-tenth of a per cent of the sodium salt of benzoic acid is usually regarded as satisfactory in preventing fermentation in [canned] goods packed commercially, and to produce similar results using formic acid it would probably be necessary to use from 0.3 to 0.5 of a per cent."

Qualitative tests for formic acid are discussed and a modification of the ferric chlorid method suggested.

Contribution to the determination of potash by the perchlorate method in fertilizers, soils, manure, crops, etc., V. SCHENKE and P. KRÜGER (*Landw. Vers. Stat., 67 (1907), No. 3-4, pp. 145-156; abs. in Chem. Zentbl., 1907, II, No. 21, p. 1759; Chem. Ztg., 31 (1907), No. 93, Repert. No. 85, pp. 577, 578; Jour. Chem. Soc. [London], 92 (1907), No. 541, II, p. 910*).—Comparisons of the perchlorate method as described by the Hildesheim experiment station, with the modified Finkener platinic chlorid method, are reported, and some modifications of the perchlorate method are suggested. The perchlorate method was found to give very satisfactory results if care was taken to remove phosphoric and sulphuric acids, ammonium salts, and free hydrochloric acid, and to prevent a large excess of barium chlorid.

The detection of peat in commercial fertilizers, J. P. STREET (*New Jersey Stas. Rpt. 1906, pp. 34-36*).—In view of the fact that "recently several manufacturing plants have been established for the drying and pulverizing of peat, and it is claimed that it is the intention to use it as a drier in mixed fertilizers, and a diluent of dried blood," examinations were made of peat and of fertilizer mixtures containing peat for the purpose of finding a reliable means of detecting this material in mixed fertilizers.

Analyses of 7 samples of peat differing widely in nature and mechanical condition showed nitrogen varying from 0.91 to 2.98 per cent and pentosans from 1.57 to 8.74 per cent. Examinations of fertilizer mixtures containing varying amounts of peat showed that "a pentosan determination will indicate as small an addition as 10 per cent of peat. If cotton-seed meal or castor pomace were used to compound the fertilizer, the test for pentosans would not establish with any certainty the use of peat, for these materials both contain pentosans.

However, these materials are used but little in the Northern States (excepting castor pomace in tobacco fertilizers), and it is believed that this simple test will in the great majority of mixed fertilizers indicate whether or not peat has been used; it will likewise serve for the detection of peat in dried blood."

Qualitative and quantitative determination of nitric acid in water and sewage, H. KLUT (*Apoth. Ztg., 22 (1907), No. 83, pp. 898, 899; abs. in Chem. Zentbl., 1907, II, No. 21, p. 1758*).—This is an abstract of a paper presented at the International Congress of Hygiene and Demography at Berlin in 1907.

For the qualitative detection of nitric acid in water and sewage the author states that brucin gives a sharper reaction than diphenylamin. For the examination of factory waste it is not possible to lay down hard and fast rules.

For the quantitative determination of nitric acid in water and sewage the Schulze-Tiemann method is considered best, with the Ulsch method as a second choice. For approximate determination of nitric acid the colorimetric method of Noll may be employed. The Ulsch volumetric method may be used with good results in case of sewage which does not contain organic nitrogen compounds.

Analysis of soils on the basis of determination of solubility as a basis for judging soils, A. RINDELL (*Abs. in Chem. Zentbl., 1907, II, No. 17, p. 1443*).—The author concludes on theoretical grounds that determination of solubility is the proper means of ascertaining the assimilable plant food in soils, and he discusses the selection and use of solvents for this purpose.

Determination of caustic lime by the use of a sugar solution, J. HENDRICK (*Analyst, 32 (1907), No. 378, pp. 320-325; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 19, p. 1067*).—In the method proposed 5 gm. of powdered burnt lime is mixed with 10 cc. of alcohol and the volume made to 500 cc. with a 10-per cent solution of sugar. The flask containing this solution is immediately placed in a shaking machine making 50 to 60 revolutions per minute and shaken for at least 4 hours. A portion of the solution is then filtered or decanted and titrated with standard hydrochloric acid, using methyl orange as an indicator. The method was found to give as a rule results about 1 per cent lower than those obtained by direct titration, and always lower than those calculated from a complete analysis.

The determination of carbon monoxid in atmospheric air, J. L. R. MORGAN and J. E. MCWHORTER (*Jour. Amer. Chem. Soc., 29 (1907), No. 11, pp. 1589-1592; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 23, p. 1251*).—Various improvements in the installation of the apparatus used for the determination of carbon monoxid by passing it over heated iodin pentoxid are described, and a modified method is presented, "in which, after the iodin formed by the reaction is removed by a potassium iodid solution, the carbon dioxid is absorbed in barium hydroxid solution and determined by titration with oxalic acid. A check on the same sample can then be obtained, if desired, by titrating the iodin absorbed in the potassium iodid solution with N/1000 sodium thiosulphate."

International methods for the analysis of fertilizers, feeding stuffs, and agricultural products (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 4, pp. 457-474; Ann. Chim. Analyt., 12 (1907), Nos. 9, pp. 359-365; 10, pp. 400-405; 11, pp. 435-442*).—These are accounts of the international conference of representatives of France, Belgium, The Netherlands, and Luxemburg, held at Paris, July 10 and 11, 1906, and give in detail the methods of analysis agreed upon at the conference.

Official methods for the analysis of sugars, sirups, and confectionery (*Betterave, 17 (1907), No. 436, pp. 382-384*).—French official methods for the analysis of sugar and sugar products are quoted from *Journal Officiel* for April 26, 1907.

A new distilling apparatus with air cooler for nitrogen determinations, J. Schmidt (*Österr. Chem. Ztg., 10 (1907), No. 19, pp. 266, 267, figs. 2; Ztschr. Angew. Chem., 20 (1907), No. 47, pp. 2027, 2028, figs. 2*).—The construction of the apparatus is briefly described.

METEOROLOGY—WATER.

Report of the Chief of the Weather Bureau, 1905–6 (*U. S. Dept. Agr., Weather Bur. Rpt. 1905–6, pp. XX+405*).—As usual, part 1 of this document consists of an administrative report reviewing the operations of the Weather Bureau during the year and including statements regarding additions to equipment and extension of the work; part 2 gives a list of observing stations and changes therein during 1905, and twice-daily observations for 29 selected stations during 1905; part 3, monthly and annual meteorological summaries for 201 stations; part 4, monthly and annual means and extremes of temperature and dates of first and last killing frosts, 1905; part 5, monthly and annual precipitation, 1905, and monthly and seasonal snowfall, 1905–6; and part 6, miscellaneous meteorological tables and reports.

Among the subjects to which special attention is called are the enlargement of the field of observation by cooperation with the weather services of other countries and especially by the organization of a system of observations from vessels at sea; the extension of the storm-warning service to include all wireless telegraph stations of the Navy Department along the coasts of the Atlantic and Pacific oceans and the Gulf of Mexico; the increase in the number of meteorological stations in the United States, now including 187 first-order stations employing 513 persons, and in the distribution of forecasts and special warnings, these forecasts and warnings being sent by telegraph to 2,150 persons in the United States, with a daily issue of 1,625 weather maps from Washington and 25,000 copies from the 105 stations outside of Washington; the establishment, in cooperation with the Forest Service, of stations for observation on precipitation and temperature at high levels; the development of the equipment and work at the Mount Weather Research Observatory; special observations on solar radiation in connection with the Astrophysical Observatory, Smithsonian Institution; extension of the teaching of meteorology; and investigation of frost conditions in cranberry regions with a view to obtaining more precise and detailed information concerning meteorological and soil conditions in the cranberry marshes of Wisconsin preceding, accompanying, and following frosts, for the purpose of establishing a scientific basis for more accurate frost predictions for those sections of the country devoted to this special industry.

Meteorological observations, J. E. Ostrander and T. A. Barry (*Massachusetts Sta. Met. Buls. 227, 228, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1907, are presented. The general character of the weather of each month is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.78, February 24; minimum, 28.99, April 9; mean, 30.018. *Air temperature*, in ground shelter (degrees F.).—Maximum, 96; August 12; minimum, —23.5, January 24; mean, 45.2. *Humidity.*—Mean dew-point, 36.9; mean relative humidity, 77.9. *Precipitation.*—Total rainfall or melted snow, 42.27 in.; number of days on which 0.01 in. or more rain or melted snow fell, 122; total snowfall, 54.5 in.

Weather.—Total cloudiness recorded by sun thermometer, 2,137 hours, or 48 per cent; number of clear days, 95. *Bright sunshine.*—Number of hours recorded, 2,317 hours, or 52 per cent. *Wind.*—Prevailing direction, west; total movement, 60,016 miles; maximum daily movement, 529 miles, February 3; minimum daily movement, 18 miles, December 8; maximum pressure per square foot, 32.5 lbs., July 20, west. *Dates of frost.*—Last, May 22; first, September 27. *Dates of snow.*—Last, May 11; first, November 24.

The weather of 1906, F. Wakerley (*Midland Agr. and Dairy Col., Rpts. Expts. Crops and Stock, 1906–7, pp. 131–134, chart 1*).—This is a summary of observations at the Midland Agricultural and Dairy College, Kingston-on-Soar, Notts, on the temperature of the air and of the soil at a depth of 1 ft., and on the rainfall during each month of the year. The rainfall of each month is compared with the average for 32 years. The mean daily temperature for the year was 48.2°, 0.6° below the average for 30 years, and the total rainfall 21.26 in., about 4 in. below the average for 32 years. The relation of the weather conditions to the growth of the staple crops of the region is briefly discussed.

Meteorological observations for the year 1906 at the Ploti Agricultural Experiment Station, M. Boulatovitch (*Ghodïchnuiĭ Otchet Ploty. Selsk. Khoz. Opuitn. Stantziĭ, 12 (1906), pp. 1–34, 229–234*).—Unlike the preceding year, which was characterized by a marked deficiency of rainfall, the rainfall for 1906, 21.74 in., was considerably in excess of the mean for the 12 years ending with 1906, 16.1 in. The excess occurred in winter and spring, the rainfall for the autumn being somewhat below the normal and resulting in injurious droughts. Violent downpours of rain characterized the precipitation of the year. The mean relative humidity for the year was 75 per cent, approximating quite closely the mean for 12 years, 78 per cent. The evaporation for the year was 27.56 in., the mean for 12 years being 32.78 in.

The mean annual temperature was 9.2° C., or 0.2° C. above the 12-year normal. The maximum temperature, 31.7° C., was recorded June 30, the minimum, —18.5° C., January 4. The maximum temperature of the surface soil was 56.6° C., the minimum, —14.2°. The average atmospheric pressure for the year was 29.22 in., or 0.01 in. below the normal, but the pressure was very variable throughout the year. The number of hours of sunshine recorded was 2,074.2, being 4.5 hours below the normal.

Meteorological observations, W. Fawcett (*Ann. Rpt. Pub. Gard. and Plantations Jamaica, 1907, pp. 28, 29*).—Summaries are given of observations at the different botanic gardens of Jamaica on atmospheric pressure, temperature, rainfall, dew-point, and humidity for the period from April, 1906, to March, 1907, inclusive.

Meteorological observations, A. W. Bartlett (*Rpt. Bot. Gard. Brit. Guiana, 1906–7, pp. 23–29*).—Tabular summaries are given of observations on rainfall, temperature, sunshine, pressure, relative humidity, wind movement, and earthquakes at the Botanic Gardens of British Guiana.

The influence of forests upon wind velocity, J. Murat (*Abs. in Science, n. ser., 26 (1907), No. 668, p. 518; Ciel et Terre, 28 (1907), No. 10, pp. 252, 253; Rev. Gén. Agron., n. ser., 2 (1907), No. 7–8, pp. 296, 297*).—A series of observations are recorded from which the conclusion is drawn that "the greatest effect which a forest can have upon the wind consists in diminishing the wind velocity to leeward of the forest. At 50 meters (164 ft.) this decrease in velocity may amount to 3 to 12 kilometers (4–7½ miles) an hour, which means a reduction of the force by the wind by one degree on the Beaufort scale. This decrease is felt within 100 meters (330 ft.) of the forest. After that the velocity increases again with increasing distance, and at about 500 meters (1,640 ft.) reaches the force noted before the forest was encountered."

Precipitation in the Letzlingen moor, J. SCHUBERT (*Ztschr. Forst u. Jagdw., 39 (1907), No. 8, pp. 509–513, fig. 1; abs. in Science, n. ser., 26 (1907), No. 668, p. 517*).—"It is pointed out that of seventeen stations in forest, on the forest edge, and in the open, the forest stations show a greater precipitation (1901–1905), and the stations in the open show the least. Corrections for snowfall and for difference in the exposure of the gages as regards wind, amount to 5.5 per cent; the observed difference in catch being 5.2 per cent. It thus appears that, as has previously been the case when the conditions of forest rainfall have been critically examined, the probability of error is about equal to the apparent difference in the amount of precipitation."

The rainfall in the Philippines, M. SADERRA MASO (*Manila: Dept. Int., Weather Bur., 1907, pp. 32*).—This report gives detailed data for the amount and distribution of rainfall in different parts of the Philippine Archipelago. The data recorded show that the rainfall is as a rule high but very variable in distribution.

"In respect to rainfall three different climates can be distinguished in these islands:

"The first, and worst of them, has two well-defined seasons, wet and dry. This climate prevails in those regions which during the summer months receive more than 80 per cent of the annual rainfall, and consequently have 5 rainy months and practically 7 of drought. Such regions are those facing the China Sea, the low plains extending northward and eastward from Manila Bay, the moderately high and hilly lands surrounding these plains, and the part of the provinces of Luzon facing the southern seas with mountains to the north. The same climate is found also in some valleys and plateaus extending along the central mountain range of Luzon, as Baguio (1,456 meters above sea level).

"The second climate consists of 8 or 9 months of rain and only 4 or 3 months of drought, the percentage of rainfall being high during both the summer and winter season. This climate prevails in the eastern and southeastern parts of Luzon and in the central Visayas, where the northeasters blow almost without any obstacle.

"Finally, the third and best climate is that which results from a fairly even distribution of the rainfall over the whole year, and consequently shows a quite uniform percentage for the three different sasons, summer and autumn, winter, and spring months. This climate is found south of the fourteenth parallel only, being enjoyed by some regions of southeastern Luzon, the eastern Visayas, Mindanao, and Jolo. The western part of Mindanao, as is shown by the records of Zamboanga, is the region of the whole Archipelago which receives the smallest amount of annual rainfall; but this deficiency is largely counterbalanced by a fairly regular distribution, so much so, that the tropical climate of Zamboanga is considered as one of the best in the Archipelago."

Composition of Barbados rainfall, J. P. D'ALBUQUERQUE and J. R. BOVELL (*Rpt. Agr. Work Barbados, Imp. Dept. Agr. West Indies, 1904–1906, pts. 1–2, p. 3*).—The amount and composition (chlorin and nitrogen content) of the rainfall from December, 1904, to May, 1906, are tabulated. The total rainfall for that period was 54.41 in., supplying approximately 303.5 lbs. of chlorin and 11.55 lbs. of nitrogen per acre. Much the larger proportion of the nitrogen carried down by the rainfall was in the form of nitrates.

A contribution to the study of evaporation from water surfaces, J. R. SUTTON (*Sci. Proc. Roy. Dublin Soc., n. ser., 11 (1907), No. 13, pp. 137–178, pl. 1*).—This paper reports a continuation of studies on the subject by the author, and deals with experiments made under the natural meteorological conditions of the South African table-land, "that is to say, under the open sky or in louvered screens, the water surfaces being warmed or cooled by contact with the air alone." Records obtained with a Piche atmometer, on metal tanks, and from vessels placed at the bottom of heavy metal tubes are discussed with reference to the influence of varying conditions, on evaporation. The Piche atmometer showed an evaporation of 84.48 in. per year at Kimberley; the evaporation from a screened metal tub 14 in. in diameter and 18 in. deep was 65.94 in.

Surface water supply of [different regions of the United States], 1906 (*U. S. Geol. Survey, Water-Supply and Irrig. Papers Nos. 207, pp. V + 94, pls. 4, figs. 2; 208 pp. VI + 190, pls. 5, figs. 2; 209, pp. IV + 79, pls. 2, figs. 2; 210, pp. 114, pls. 2, figs. 2*).—These bulletins contain reports in the usual form on the progress of stream measurements in Upper Mississippi River and Hudson Bay Drainages, by A. H. Horton and R. Follansbee; Missouri River Drainage, by R. Follansbee, R. I. Meeker, and J. E. Stewart; Lower Western Mississippi River Drainage, by R. I. Meeker and J. M. Giles; and Western Gulf of Mexico and Rio Grande Drainages, by T. U. Taylor and W. A. Lamb.

Geology and water resources of the Bighorn basin, Wyoming, C. A. FISHER (*U. S. Geol. Survey Prof. Paper No. 53, pp. VI + 72, pls. 16, fig. 1*).—"This paper is the result of field work done during the seasons of 1904 and 1905. It is designed mainly to furnish information regarding geologic structure and the prospects for underground water. . . . A general account of the surface waters is given, including a statement of their present and proposed uses for irrigation, and the economic products of a geologic nature are also described. The region considered comprises the Bighorn basin, a part of the Clark Fork basin, and the slopes of the adjoining mountain ranges, the entire area comprising 8,500 square miles."

Underground waters, P. OTOTZKI (*Trudui Opuitn. Lyesn., 1906, No. 4; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 3, pp. 339–341*).—The author gives a detailed account of his observations extending over a number of years on the influence of forests on ground water. These observations were carried out systematically in typical regions in different parts of Russia. The observations on the fluctuations in the level of the ground water were made in series of wells in areas covered by forests and in open land of the same character adjacent to the forests.

The main conclusions reached are that during the period of growth the level of the first horizon of ground water is much lower in forests than in adjoining open land, and that this lowering of the water level in the forest soil is due to the active transpiration of the forest growth. It was observed also that the lowering of the water level in the forest caused a lowering in the adjacent open land, that is, there was a flow of water from the open field to the forest soil. It therefore appears that forests not only do not accumulate stores of moisture in the subsoil but rapidly dissipate the moisture of the soil and in some cases draw upon the ground water of adjacent open land. The depressing power of the forest growth is at times so great that it masks and even overcomes the hydrological action of other factors.

The report presents not only the author's observations, but also summarizes the results of experiments and observations by other investigators.

The utility of hydrological investigations from the agricultural standpoint, R. D'ANDRIMONT (*Jour. Soc. Cent. Agr. Belg., 54 (1907), No. 9–10, pp. 243–261, figs. 12*).—The application of such investigations in the improvement of soils by irrigation, drainage, etc., and in providing a sufficient supply of potable water, is discussed.

Investigations on water, A. J. J. VANDEVELDE (*Separate from Bul. Serv. Surveill. Fabric. et Com. Denrées Aliment., 1907, pp. 8–16*).—This is a classified list of general treatises and reports on investigations on water published during

1906. The publications included refer to chemical anaylsis, mineral constituents, nitrogenous and organic constituents, bacteriological and biological examination, contamination, and purification.

New apparatus for the sterilization of drinking water by heat (*Engin. News, 58 (1907), No. 18, pp. 457-460, figs. 10*).—Simple potable apparatus for continuous sterilization by heat are described.

Manufactured ice, H. B. MELOY (*Bur. of the Census [U. S.] Bul. 83, pp. 43-61, map 1*).—The total value of the ice manufactured in the United States in 1905 was $23,790,045, an increase of 71.5 per cent over the amount produced in 1900.

Sewage disposal in the country, SOMMERVILLE (*Country Life [London], 22 (1907), No. 565, pp. 628, 629*).—This article briefly discusses the applicability of combined septic tank and contact bed methods to small town and country conditions.

SOILS—FERTILIZERS.

The soil, J. DUMONT (*La Terre Arable. Paris, 1907, pp. XII+, 295, figs. 20; rev. in Rev. Gén. Sci., 18 (1907), No. 17, pp. 728, 729*).—This is a volume of *Encyclopédie de l'Agriculture et des Sciences Agricoles*, and treats in a more or less popular way the formation and physical, chemical, and mineralogical constitution of the soil; its organic and mineral constituents and physical, chemical, and biological properties; its humifying, nitrifying, denitrifying, and nitrogen fixing organisms, and the chemical character of the processes involved in the mobilization of the soil constituents.

On the practical importance of chemical analysis of soils, A. VON 'SIGMOND (*Ztschr. Landw. Versuchsw. Osterr., 10 (1907), No. 7, pp. 581-603, fig. 1; abs. in Chem. Zentbl., 1907, II, No. 8, p. 633*).—The principal features of this article have already been noted from another source (E. S. R., 19, p. 6).

The author concludes from his studies of a large number of Hungarian soils of different types that his method of chemical analysis is as reliable as pot experiments as a means of judging of the phosphoric acid requirements of soils. According to his observations, soils containing from 75 to 80 mg. or more of easily assimilable phosphoric acid per 100 gm. of soil, as shown by his methods, do not require applications of phosphatic fertilizers. The basicity of soil as determined by its neutralizing power for dilute nitric acid is considered to have an important bearing upon its phosphoric acid requirements. In the group of soils found to be benefited by applications of phosphoric acid the basicity increased with the amount of assimilable phosphate. Apparently an increase in basicity is accompanied by a decrease in assimilability.

The use of soil surveys, J. A. BONSTEEL (*Sci. Amer. Sup., 64 (1907), No. 1657, pp. 221, 222*).—This is a reprint of an article in the Yearbook of the Department for 1906 (E. S. R., 19, p. 214).

The agricultural soils of the territory of Grotte di Castro, D. ORZI (*Gior. Geol. Prat., 4 (1906), Nos. 2-3, pp. 49-93, pl. 1; 6, pp. 197-240; 5 (1907), Nos. 1, pp. 27-32; 2-3, pp. 64-98, maps 2*).—This article reviews at some length the literature of similar soil investigations and reports the results of a detailed study of the geological and soil conditions of this volcanic region, classifying, mapping, and describing the soil types which occur in the region. Numerous analyses are given and the cultural adaptability and fertilizer requirements of the soils are discussed. A bibliography of 62 references is given.

Examinations of soils from German East Africa, V. LOMMEL (*Ber. Land. u. Forstw. Deutsch-Ostafrika, 3 (1907), No. 3, pp. 139-142*).—Analyses of several samples of soil from different parts of this region are reported and briefly discussed.

On certain physical-chemical processes in the formation of soils, Rohland (*Landw. Jahrb., 36 (1907), No. 3, pp. 473–483; abs. in Chem. Zentbl., 1907, II, No. 9, p. 724*).—The author ascribes the colloids of the soil to the decomposition of feldspars by water and carbon dioxid. The colloids are flocculated by the addition of an electrolyte, apparently dependent upon the simultaneous separation of hydroxyl ions from the alkali. The permeability of the soil depends upon this flocculation. Soils which contain colloidal hydroxids give off or take up water at constant temperatures until the vapor tension of the colloids is in equilibrium with their surroundings, the water content varying constantly with changes in temperature. The author lays great emphasis on the importance of chemical and physical processes in the formation of soils.

On the distribution of plant food in soil particles of different sizes, Puchner (*Landw. Vers. Stat., 66 (1907), No. 6, pp. 463–470; abs. in Chem. Ztg., 31 (1907), No. 58, Repert. No. 53, p. 350*).—It was found that a diluvial coarse sandy weathered gneiss soil was decidedly poorer in potash in its finer particles than a tertiary compact weathered loam and a diluvial loess. The potash (and also silica and soda) content as a rule decreased as the fineness of the particles increased in all of the soils; on the other hand the content of aluminum, iron, and manganese, as well as humus, increased with fineness of particles. No uniform relation was observed in case of lime, magnesia, and phosphoric acid.

Influence of fallow culture on soil-moisture, G. Nazarov (*Selsk. Khoz. i Lyesov., 1905, No. 12; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 1, p. 82*).—The author gives data gathered during 10 years on the Poltava experiment field concerning the significance of fallow culture in relation to the accumulation of moisture in the soil.

The experiments were conducted in a three-course rotation (fallow, winter wheat or winter rye, and summer wheat) on plats 1,568 sq. ft. each. Samples of soil were taken at the following depths: (1) 0 to 10 cm., (2) 10 to 25 cm., (3) 25 to 40 cm., (4) 40 to 55 cm., (5) 55 to 70 cm., (6) 70 to 85 cm., (7) 85 to 100 cm., (8) 100 to 115 cm., (9) 115 to 130 cm., (10) 130 to 150 cm. The first determinations of moisture were made at the time of the plowing of the black fallow, the second at the time of the turning over of the April fallow, the third at the time of plowing the May fallow, the fourth at the time of the turning over of the June fallow, the fifth in the middle of July, and the sixth at the time of the sowing of the winter cereal. The determinations of moisture were made simultaneously on all the fallows.

The mean data for 10 years show that in the winter all kinds of fallow have the same moisture content. At the time of turning over of the April fallow the moisture content of all the fallows except that of July was also the same, but in the cultivated layer (0 to 25 cm.) the black fallow was more moist than the others. At the time of the plowing of the May fallow the amount of water within the entire depth under examination was the greatest in the April fallow, followed in declining order by the black, the May and the June fallows. In the cultivated layer the moisture was greatest in the black fallow.

About the time of the turning over of the June fallow there was the most moisture, both in the cultivated layer and throughout the remaining depth, in the black fallow, which is due to the large precipitation during this month. The determination of moisture in the second half of July showed a striking preponderance in the April fallow over the black fallow, both throughout the entire thickness of the layer under examination and in the cultivated horizon. About the time of the sowing of the winter cereals the moisture in the 0 to 10 cm. layer and also the 10 to 25 cm. layer was higher in the April fallow. In all cases considered the May fallow was always more moist than the June fallow.

From these data it follows in general that the black fallow was inferior to the April fallow in moisture, which is corroborated by the average yields of winter wheat during 5 years. This result, which stands in direct contrast with the generally accepted view of the significance of the black fallow, is ascribed by the author to the conditions of the three-course rotation.

Investigations on the behavior of fallows, W. Krüger and B. Heinze (*Landw. Jahrb., 36 (1907), No. 3, pp. 383–423, pl. 1*).—In a study of the form and amount of nitrogen compounds in fallow and unfallowed soil and of changes in the kind and number of micro-organisms in the soils, especially those which fix nitrogen, it was found that there was a considerable increase of water-soluble nitrogen compounds, especially nitrates, in the fallow soil. There was also an increase in total nitrogen in the fallow. The organisms increased decidedly after the first cultivation and then gradually decreased. The organisms which grow on gelatin were more numerous in the fallow than in the unfallowed soil.

Certain organic constituents of soils in relation to soil fertility, O. Schreiner, H. S. Reed, and J. J. Skinner (*U. S. Dept. Agr., Bur. Soils Bul. 47, pp. 52, pls. 6*).—It is stated in this bulletin that the unproductiveness of soils is frequently due not to deficiency in nutrient mineral substances but may be explained by the presence of substances actually deleterious to plant growth derived from plant excretions or from the breaking down of organic matter in the soil. Various facts which substantiate this belief are presented and simple operations by which such toxic properties can be overcome are described, as has already been done in previous bulletins of the Bureau (E. S. R., 17, p. 340; 19, pp. 13, 117).

Assuming that "the toxic properties of soils have been demonstrated and the existence of toxic bodies is a reality with which it is necessary to deal in future soil studied on the fertility and infertility of our agricultural lands," and in view of the difficulty of isolating the toxic organic bodies from the soil by purely analytical methods, the authors undertook a series of experiments in which seedling wheat plants were grown in solutions to which varying amounts of pure compounds of known composition, properties, and derivation from plants were added. These compounds included a series of substances formed by the breaking down of proteid bodies and derived from lecithins and other nitrogenous bodies, as well as certain nonnitrogenous bodies which it was believed might occur in soils.

The compounds experimented with were as follows: Derived from proteids—aspartic acid, asparagine, glycocoll, alanine, leucine, and tyrosine; derived from lecithins—choline, neurine, and betaine; other nitrogenous bodies—alloxan, guanine, xanthine, guanidine, skatol, pyridine, picoline, piperidine, quinolin, ricin, and mucin; nonnitrogenous bodies—pyrocatechin, arbutin, phloroglucin, vanillin, vanillic acid, quinic acid, quinone, cinnamic acid, sodium cinnamate, cumarin, daphnetin, esculin, piperonal, (heliotropine), borneol, camphor, and turpentine. The literature of previous investigations relating to the derivation, occurrence, and properties of these bodies is noted.

In studying the effect of the various compounds on the growth of the wheat plants "two, and sometimes three, criteria of growth were employed, viz, transpiration, green weight, and turgidity. No one of these criteria can be regarded as absolute, but they usually agreed in indicating the order of results, which was the point sought for in these experiments."

The results show in general a marked toxic effect in case of a large proportion of the compounds used, but the limit of toxicity varied widely and the toxic effect was often replaced by a stimulating action in the lower concentrations.

A study of means of removing or overcoming toxic conditions indicated "that there are numerous ways in which such unfavorable conditions may be overcome. The toxic solutions were markedly improved by treatments similar to those which benefit the extracts of unproductive soils. Treatment with absorbing agents or brief boiling was beneficial. The toxic solutions were greatly improved after one set of wheat plants had been grown in them. Undoubtedly there was some toxic material directly absorbed by the first set of plants, but the amount was entirely too small to account for the diminished toxicity of the solutions when the second set of plants was grown. The vanillin solution, for example, was so reduced in toxicity that a solution originally containing 500 parts per million was no more toxic to the second set of plants than a solution of 50 parts per million was to the first. It has been found that an equal number of wheat plants can remove in a similar length of time not more than 30 to 50 parts per million of nitrates from solution and there is no reason to believe that toxic substances should be removed at a much more rapid rate. The oxidizing powers of the roots therefore appear to be able to act upon the toxic organic materials in such a way that their toxic properties are lost. The large amount of root surface which most plants possess makes this oxidizing power an important one in relation to soil conditions and especially in relation to the destruction of toxic conditions through crop rotation.

"In the experiments described it was shown that while the plants alone and fertilizer substances alone were able to accomplish a partial destruction of the toxic substances the combined action of plants and substances ordinarily employed as fertilizers caused a much greater destruction of toxic material and consequent improvement in growth." . . .

"It has been demonstrated by the studies described in this bulletin that substances commonly used as fertilizers in agricultural practice have in addition to their function as plant nutrients a well-defined power to overcome and actually destroy toxic bodies. Substances like nitrate of soda and lime, acting in cooperation with the activities of the plant roots, are able to destroy or render harmless various organic substances which previously had a toxic effect on the plants."

It is stated that previous investigations of the Bureau had shown that "toxic soil extracts may be greatly improved by the addition of fertilizer substances, but up to the present the method by which amelioration was brought about had not been demonstrated. It had been distinctly shown, however, that amelioration was not due to the addition of plant nutrients, since equal, if not greater, improvement resulted from treatments which added nothing in the nature of plant nutrients. The present investigations become of value, therefore, in showing that fertilizer substances have a power to act destructively upon deleterious organic compounds, especially when associated with the activities of growing plants."

On humus acids, A. J. Van Schermbeck (*Jour. Prakt. Chem., n. ser., 75 (1907), No. 10-11, pp. 517-525; abs. in Chem. Zentbl., 1907, II, No. 8, p. 624*).—A report of previous studies by P. Malkomesius and R. Albert is critically reviewed. The author considers the term humus acids as used by these investigators as having no significance and doubt is cast upon the results of their work on the subject. Attention is called especially to the complex character of the humus extract obtained by repeated extraction with boiling alcohol according to the Fresenius method. It is believed that the precipitated substances obtained by such methods are simply absorption complexes formed when colloids and resinous matter are precipitated by an electrolyte. The results of tests of various methods of determining the acidity of a moor soil are reported, from which the conclusion is drawn that for judging of the danger of injury to roots of plants extraction in water with pressure of the residue is the best method;

for judging of the means of improving (rendering alkaline) a sick soil, the hot alcohol extraction method is best.

Chemical and bacteriological factors in the ammonification of soil nitrogen, J. G. Lipman (*New Jersey Stas. Rpt. 1906, pp. 119-187*).—This article reports a series of experiments with nutrient solutions consisting of Witte's peptone, gelatin, or egg albumen, with the addition of the ordinary mineral salts, and in some cases, mannite, which were inoculated with infusions of soils of different kinds and previous treatment, or with pure cultures of common soil organisms. The progress of ammonification was ascertained by determining the ammonia in the cultures from time to time, usually at intervals of from 3 to 6 days.

The results obtained under a variety of conditions are reported and discussed in detail. They indicate in general that the ammonifying organisms are unequally represented in different soils and that the addition of salts to the nutrient solution promotes their activity. In some cases the bacteriological factor appeared to predominate over the chemical, although the chemical composition of the soil was apparently very important. It was found "that, under the conditions of the experiment, the bacteriological differences developed in initially identical soil by varying fertilizer treatment are brought out clearly and consistently, whether soil infusion or the soil itself is used as inoculating material." It was also found "that the new samples were much superior to the old in their power of ammonification, and likewise, that the direct soil inoculations led to the production of more ammonia in the culture solution than was true of the corresponding soil-infusion inoculations."

In experiments with Azotobacter growing in nutrient solutions containing mannite data were obtained which showed that "different soils may give up mineral salts to mannite solutions, with which they are in contact, in quantities large enough to supply the needs of vigorously growing Azotobacter cells. . . . The growth of the Azotobacter organisms in the mannite solutions, the formation of carbon dioxid in accompanying this growth, and the presence of the mannite itself, each exerted a certain effect on the solution of the soil phosphates. The soils which yielded the greatest amount of phosphates to the mannite solution allowed also the most vigorous development of the bacteria. On the other hand, the solutions which contained the organisms growing most vigorously parted most rapidly with their phosphates, and thereby hastened the further solution of the soil phosphates. For this reason there was proportionately and absolutely more Azotobacter growth in the mannite solutions containing larger amounts of phosphates of greater initial solubility."

A method of determining the mineral requirements of soils based upon these facts is outlined.

Losses of ammonia from culture solutions, J. G. Lipman, and P. E. Brown (*Jour. Amer. Chem. Soc., 29 (1907), No. 9, pp. 1358-1362*).—Determinations of ammonia were made in sterilized and unsterilized Omeliansk culture solutions immediately after preparation and after having been kept in an incubator 6, 12, and 24-25 days. Large losses of ammonia occurred as a result of sterilization as well as on keeping the sterilized solution in the incubator at a temperature of 28° C.

In the first series of experiments reported the sterilized solution lost about three-fifths of its ammonia in 24 days. In a second series of experiments, in which calcium carbonate was substituted for magnesium carbonate in some of the tests, it was found that while the magnesium carbonate solutions lost considerably more than one-half of their ammonia nitrogen in 25 days, the calcium carbonate solutions lost scarcely more than one-eighth of the initial amount. In calcium carbonate solutions inoculated with soil infusion a small amount of the ammonia nitrogen was converted into nitrite or nitrate nitrogen, but "the quantity of nitrite and nitrate nitrogen thus recovered [was] not sufficient to account for the greater loss of ammonia from the inoculated solution. The discrepancy observed here would tend to support the claim made by Godlewski and others that gaseous nitrogen may be liberated in the nitrification of ammonia."

Studies on nitrification in the soil of Egypt, R. ROCHE (*Bul. Assoc. Chim. Sucr. et Distill., 24 (1907), No. 12, pp. 1699–1701; Bul. Inst. Égyptien, 5. ser., 1 (1907), No. 1, pp. 107–113; abs. in Jour. Chem. Soc.* [*London*], *92 (1907), No. 538, II, p. 643; Jour. Soc. Chem. Indus., 26 (1907), No. 16, p. 936*).—Examinations of a large number of samples show that the proportion of nitric nitrogen in Egyptian soils is very small, in some cases entirely lacking, particularly in the poor, dry soils. Irrigation supplying from 15 to 25 per cent of moisture furnished in the experiments reported the most favorable condition for nitrification. The application of nitrogenous fertilizers, such as sabak and sulphate of ammonia, and fallowing, increased the rate of nitrification to a considerable extent.

The absence of nitrification in forest soils, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 13 (1907), No. 21, pp. 645, 646*).—This is a brief discussion based upon investigations by E. Henry tending to show that although forest soils increase in nitrogen content nitrification does not occur in such soils.

On nitrogen-fixing bacteria, II, F. LÖHNIS and N. K. PILLAI (*Centbl. Bakt.* [*etc.*], *2. Abt., 19 (1907), No. 1–3, pp. 87–96, pl. 1*).—Investigations relating to the behavior of a number of nitrogen-fixing organisms on different kinds of culture media are reported, and two new species, *Bacillus malabarensis* and *Bacterium tartaricum*, are described in detail. See also previous work (E. S. R., 17, p. 447).

The inoculation of leguminous seeds by the methods of Hiltner and Moore, M. EICKEMEYER (*Fühling's Landw. Ztg., 56 (1907), No. 10, pp. 356–358; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 20 (1907), No. 6–7, p. 169*).—Negative results with Hiltner's improved nitragin obtained by Voelcker and others in pot experiments are attributed to experimental conditions which mask or prevent beneficial action, since in field experiments Voelcker obtained better results with the nitragin. The negative results in all cases with Moore's cultures are ascribed to destruction of the organisms by drying in the process of preparation.

Experiments with Nitragin, C. MACÍAS (*Com. Par. Agr.* [*Mexico*], *Circ. 62, pp. 4, pls. 8*).—Beneficial results from the use of this material on frijoles and lentils are reported.

The influence of mineral fertilizers on the fixation of nitrogen by lower organisms in the soil, H. WILFARTH and G. WIMMER (*Landw. Vers. Stat., 67 (1907), No. 1–2, pp. 27–50; abs. in Chem. Zentbl., 1907, II, No. 15, p. 1264; Chem. Abs., 1 (1907), No. 22, p. 2810*).—In the experiments reported pots containing 2 kg. of sand were fertilized with various combinations of mineral nutrients, some being uninoculated and some inoculated with soil extract.

Determinations of the nitrogen content and organic matter of different layers of the soils at the beginning and end of the experiments (vegetation period) showed in brief that in the presence of sufficient amounts of potash, lime, and magnesia, pure sand which had been inoculated by means of soil extract did not fix any free nitrogen when phosphoric acid was lacking. When phosphoric acid was added, however, there was a considerable fixation of nitrogen. The production of organic matter by various kinds of algae was also dependent upon the presence of phosphoric acid. One part of combined nitrogen corresponded on an average to 20 parts of organic matter produced.

On the action of certain poisonous substances on the bacterial flora of soils, M. EICKEMEYER (*Wiener Landw. Ztg., 57 (1907), No. 64, p. 600*).—The effects of carbon bisulphid, creosol, soap solution, copper and iron sulphate preparations, arsenic, and carbolineum are briefly described.

The increase of crop yields by stimulants, F. HOLLRUNG (*Abs. in Engrais, 21 (1906), No. 49, pp. 1191, 1192; Chem. Abs., 1 (1907), No. 15, p. 2018*).—The author reports increase of yield of sugar beets following applications of carbon bisulphid, which he ascribes to destruction of parasites and stimulation. Passing an electric current through a nutrient solution containing potassium iodid and fluorid also resulted in an increase of yield and sugar content. The work of other investigators on the effect of carbon bisulphid on the bacterial flora and activities in the soil is referred to.

Soils and manures, V. H. KIRKHAM (*Notes Agr. Anal. County Tech. Labs. Chelmsford, 1903–1906, pp. 7–21, 42–51*).—Chemical analyses and notes on general character of the soils of Tendring Hundred, Essex, and for various fertilizing materials examined from October, 1903, to October, 1906, are given. The subject of lime manures and liming is also briefly discussed.

Cattle manure, D. CLOUSTON (*Agr. Jour. India, 2 (1907), No. 3, pp. 261–269*).—An account is given of comparative tests of the profitableness of cattle manure, manure ashes, the principal local fertilizers, and saltpeter on irrigated and unirrigated wheat, which show that the manure was more profitable and had a greater residual effect than the saltpeter, and that the manure ashes had only about one-third the fertilizing value of the manure.

"Analyses of fresh Indian cattle dung show that it is normally rich in nitrogen. Rotted Indian cattle manure contains a comparatively low percentage of moisture, often not more than 35 per cent, while that made in Great Britain generally contains 70 to 75 per cent, and for that reason the percentage of nitrogen is very much higher in the former than in the latter." The most efficient means of preserving and using cattle manure under Indian conditions are described.

The use of fertilizers on southern Indiana soils, A. GOSS (*Indiana Sta. Circ. 10, pp. 16, figs. 3*).—This circular reports in brief the results of experiments which have been carried on by the station for a number of years past "with a view to ascertaining the methods of fertilization best adapted to the different soils and crops of the State. In this connection tests have been made on practically all the important soil types and have involved the use of such materials as dried blood, nitrate of soda, bone, acid phosphate, dicalcic phosphate, rock phosphate, muriate of potash, sulphate of potash, carbonate of potash, ashes, slaked lime, ground limestone, iron sulphate, iron hydrate, magnesium sulphate, magnesium carbonate, sodium sulphate, copper sulphate, carbon black, muck, clay, straw manure, and legume crops."

The results in general show "that while occasionally soils are found that do not respond to fertilizers, usually some combination has been found that has produced handsome profits and not infrequently enormous returns. There is, for example, no question that the application of potash in considerable quantities on muck soil is very profitable in connection with the growing of corn and other crops. It also seems certain that the liberal use of fertilizer on the potato crop is highly profitable, and that fertilizer will usually pay well on the wheat and corn crops, if used in the proper proportions and right amounts. The work that has been done emphasizes the fact, however, that in order to secure the best results it is necessary to understand the needs of the partciular soil and crop to be used. . . . There is not the slightest doubt that a large and profitable increase in crop production could be brought about in the State by a more systematic and intelligent use of fertilizers." The turning under of leguminous crops was found to be the cheapest means of supplying grains and other nonleguminous crops with nitrogen.

Experiments with untreated rock phosphate in comparison with acid phosphate indicate that the untreated phosphate is "a cheap and effective source of phosphorus where immediate returns are not required. . . . For quick returns, acid phosphate or some other readily available form should be used." In these experiments heavy applications of rock and acid phosphate still showed marked results after three years.

Similar results were secured with applications of potash, and the conclusion is therefore drawn that there is little danger of serious loss by leaching of either phosphorus or potassium on ordinary Indiana soils. "Nitrogen on the other hand is readily washed out and should not be applied much in excess of what can be taken care of by the immediate crop."

No injurious effect on the soil was observed from the continued use of acid phosphate. General recommendations regarding the maintenance of fertility of southern Indiana soils and specific directions for fertilizing wheat, corn, and potatoes are given.

Plant nutrition studies, E. B. VOORHEES and J. G. LIPMAN (*New Jersey Stas. Rpt. 1906, pp. 101–115*).—This is a report of progress in experiments begun in 1905 (E. S. R., 18, p. 14), the plan of which is fully described in the abstract of the last report.

The results obtained to date indicate that the red shale soils used in these experiments are in greater need of phosphoric acid than of nitrogen and potash, but that while the yield of nonleguminous plants may be materially increased by applications of phosphate alone, the best results will be obtained by using phosphates and nitrogen. "The application of potash will probably prove of some advantage only after an abundance of phosphoric acid and nitrogen had been supplied."

The experiments in the improvement of light soils at Hammonton, especially for the production of forage crops, begun in 1904 indicates that the large areas of such soils now uncultivated and unproductive "may under proper conditions be utilized for dairy purposes to supply local needs, and to furnish, besides, a supply of dairy products for the large centers of population more or less distant."

Brief accounts are also given of the results obtained with cowpeas in a rotation designed for the improvement of soils, and of field experiments with fertilizers upon asparagus.

The predominant rôle of nitrogen in the productiveness of soils, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 14 (1907), No. 32, pp. 169–171*).—The results of 8 years' comparative tests of nitrogenous and nonnitrogenous fertilizers on a soil of medium quality, somewhat deficient in nitrogen and phosphoric acid, on which potatoes, rye, colza, wheat, beets, barley, maize, and oats were grown in succession are summarized and show that the supply of nitrogen was much more important in increasing the yield than that of phosphoric acid or potash.

Investigations relative to the use of nitrogenous materials, E. B. VOORHEES and J. G. LIPMAN (*New Jersey Stas. Rpt. 1906, pp. 71–100*).—This is a report of progress in investigations which have been going on since 1899 (E. S. R., 18, p. 18). The crop grown in 1906 was wheat and the results obtained in that year are compared with those obtained with the same crop in the regular course of the rotation in 1901.

Analyses of the different kinds of manure used in these experiments are reported as in previous years, attention being called especially to the fact brought out by these analyses that exposure to the leaching action of rain results not only in a loss of soluble material but of moisture. "The reduced moisture content, as well as the elimination of the bulk of the soluble salts, influence materially the bacterial changes in the manure, for with retarded bacterial development the losses from fermentation must of necessity be smaller than those in large piles of manure. Retarded fermentation in its turn involves a retarded solution of the insoluble constituents, and hence a diminished loss from the leaching action of rain."

In case of the fresh manure the mixture of solid and liquid manure was more efficient than the solid manure alone. In case of leached manure the differences were very small, but slightly favored the solid manure. The same relation held true when the manures were used in combination with nitrate. The manures were more effective when used in combination with nitrate than when combined with ammonium sulphate or dried blood. "The double portion of nitrate, whether used alone or in combination with any of the manures, favored the production of grain in greater degree than did the corresponding single portion."

The crops receiving nitrate of soda contained a larger proportion of nitrogen in dry matter than those receiving other nitrogenous fertilizers, and under certain conditions a high nitrogen content in the grain was always accompanied by a high content in straw and vice versa. The double portion of nitrate consistently showed superiority over the single portion either when used alone or in combination with any of the manures.

It was found that the nitrogen of dried blood both alone and in combination with manure gave slightly greater returns than corresponding applications of nitrogen in the form of ammonium sulphate.

Comparing the average amounts of nitrogen recovered in the crop during the seasons of 1901 and 1906, it was found that the nitrate, ammonium sulphate, and dried blood used alone showed a falling off in the second rotation, the decline being especially marked in the case of ammonium sulphate and dried blood. This falling off is attributed to a decline in humus content of the soil and to the fact that soils continuously fertilized with ammonium sulphate and dried blood tend to become decidedly acid in the course of time. On the other hand, soils continuously fertilized with sodium nitrate tend to become more alkaline in the course of time, but may be injuriously affected by the accumulation of the sodium base, which is transformed into carbonate or bicarbonate, resulting in decided injury, particularly on heavy clay soils.

The relative availability of the nitrogen of the various materials experimented with as shown by the wheat crop in 1901 and 1906 is as follows:

The availability of nitrogen in different nitrogenous materials with wheat.

	1901.	1906.		1901.	1906.
Sodium nitrate	100.0	100.0	Solid and liquid manure, fresh	30.8	51.2
Ammonium sulphate	91.0	39.3	Solid manure, leached	24.4	33.3
Dried blood	75.7	30.2	Solid and liquid manure, leached	19.9	24.6
Solid manure, fresh	31.1	30.4			

Lime nitrogen as a fertilizer for cultivated plants, P. WAGNER ET AL. (*Landw. Vers. Stat., 66 (1907), No. 4–5, pp. 285–372; abs. in Chem. Ztg., 31 (1907), No. 58, Repert. No. 53, p. 350; Jour. Chem. Soc. [London], 92 (1907), No. 537, II, p. 573; Chem. Zentbl., 1907, II, No. 9, pp. 726, 727*).—A series of laboratory investigations and pot experiments with different soils and crops are reported.

It was found that lime nitrogen draws on the moisture and carbon dioxid of the air and gradually loses its nitrogen by evaporation; that lime nitrogen dissolves slowly in water; in contact with moist soil lime nitrogen undergoes various changes, resulting in a part of its nitrogen being converted into dicyandiamid, which is injurious to plants; carbon dioxid, humus acids, and heat favor such a change, while soil bacteria retard it by promoting transformation of the lime nitrogen into ammonia and nitric acid. Concentrated solutions of lime nitrogen hinder the formation of ammonia and nitric acid by bacteria, and the production of these compounds can proceed only in very dilute solutions of lime nitrogen. The formation of nitric acid requires even more dilute solutions than the production of ammonia. The nitrogen of urea is more rapidly converted into ammonia and nitric acid by bacterial action than lime nitrogen. The urea was more rapidly converted into ammonia in sandy soils than in loamy soils, but the reverse was true in case of lime nitrogen. The loss of ammonia from the soil by evaporation was greater in the case of lime nitrogen than in the case of ammonium sulphate.

The pot experiments with carrots, oats, barley, fodder beets, and sugar beets on 9 different kinds of soil, comparing the effect of nitrate of soda, ammonium sulphate, ammonium nitrate, ammonium carbonate, calcium nitrate, basic lime nitrate, fish guano, and green manures, showed that nitrate of soda and ammonium sulphate gave uniformly higher yields and greater nitrogen assimilation than lime nitrogen, and that the superiority of the former over the latter was greater the larger the amount of lime nitrogen applied. The effect of the lime nitrogen, however, varies with the amount applied, the character of the soil, and other conditions of application. In these experiments an application of 0.75 gm. per pot (25 cm. in diameter and 33 cm. deep) gave normal results. Using the results of pot experiments as a basis, it is calculated that, taking the fertilizing value of nitrate of soda as 100, that of lime nitrogen is 90. As already stated the conditions which favored the formation of dicyandiamid lowered the efficiency of the lime nitrogen. Conditions which favored the action of the lime nitrogen were wide and uniform distribution, thorough mixture of the lime nitrogen with the surface soil, early application (at least 14 days before seeding), abundant moisture, high bacterial content of the soil, a loamy soil in good condition, and not too large application.

The comparative data obtained for the other nitrogenous fertilizers tested showed little difference in effect between ammonium sulphate and ammonium nitrate, and on loam soils ammonium carbonate was just as efficient as the sulphate and nitrate. On sandy soils the carbonate was normal in action when applied at rates not exceeding 0.75 gm. per pot. The action of calcium nitrate was perfectly normal when applied to loam soils at a rate of 1.5 gm. per pot, and on sandy soils when applied at rates of 2.25 gm. per pot. The high lime content of the calcium nitrate and the still higher content of the basic lime nitrate produced an injurious effect. Fish guano produced a fertilizing effect corresponding to 78, taking the action of ammonium nitrate and sulphate as 100. On sandy soils the green manures were just as efficient as the fish guano. On loam soils they were somewhat less efficient.

Ammonium sulphate as a fertilizer, Hunter (*Jour. Gaslight., 59 (1907), p. 236; abs. in Chem. Ztg., 31 (1907), No. 73, Repert. No. 67, p. 453*).—The results of numerous comparative tests by different investigators of ammonium sulphate and other nitrogenous fertilizers showing the superior fertilizing value of ammonium sulphate are compiled.

Experiments with crude ammonia, L. Bargeron (*Jour. Agr. Prat., n. ser., 14 (1907), No. 34, pp. 242–246, figs. 5*).—Experiments with white mustard conducted by J. C. Pampari of the Italian union of agricultural syndicates are reviewed.

The experiments were made in boxes containing 30 kg. of soil. Ammonium sulphate used at the rate of 5 gm. per box supplying about 1 gm. of nitrogen was compared with crude ammonia (prepared from gas liquor) containing from 5 to 6.5 per cent of ammonia, at rates of 15 to 50 gm. supplying from 0.77 to 2.68 gm. of nitrogen per box. The crude ammonia was applied 30 days before seeding and at the time of seeding.

The crude ammonia was less effective than ammonium sulphate. Applications of about 1,800 lbs. per acre gave best results. The results with reference to time of application were not conclusive. Other experiments, however, according to the reviewer, have shown conclusively that the material must be applied some time before seeding to give best results. Considerable time is necessary for nitrification and transformation of injurious compounds which may be present.

Production of sulphate of ammonia (*Jour. Bd. Agr. [London], 14 (1907), No. 5, pp. 305, 306*).—The report for 1906 of the chief inspector under the alkali and works regulations acts, shows that there were 167 chemical fertilizer factories and 495 sulphate and muriate of ammonia works subject to inspection during that year in Great Britain. The imported materials used in the fertilizer factories were, guano 24,906 tons, mineral phosphates 442,970 tons, and nitrate of soda 108,486 tons. The sulphate of ammonia produced during the year in the United Kingdom was as follows: From gas works 157,160 tons, iron works 21,284 tons, shale works 48,534 tons, coke-oven works 43,677 tons, producer-gas and carbonizing works (bone and coal) 18,736 tons, total 289,391 tons. The export of sulphate of ammonia amounted to 201,500 tons, the home consumption to about 88,000 tons.

Formation of ammonia from its elements by the action of the electric spark; the influence of pressure, E. Briner and E. Mettler (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 12, pp. 694–697, figs. 2; abs. in Chem. Abs., 1 (1907), No. 16, p. 2068*).—"The authors allowed the discharge of the secondary of an induction coil to pass through a mixture of nitrogen and hydrogen corresponding to the formula N_2+3H_2, and condensed the ammonia produced in a tube cooled by liquid air, thus avoiding the destructive action of the spark on the ammonia itself. Manometric observations of the pressure allowed them to follow up the reaction. They studied the influence of the initial pressure and found that the yield in ammonia is maximum at a pressure of about 100 mm. (0.17 gm. ammonia per kilowatt hour). The existence of this maximum is due to the fact that, while increase of pressure accelerates the reaction, it, on the other hand, diminishes the electrical conductivity of the gas."

The electro-thermic combustion of atmospheric nitrogen, F. Howles (*Jour. Soc. Chem. Indus., 26 (1907), No. 7, pp. 290–297, figs. 10; abs. in Chem. Zentbl., 1907, I, No. 23, p. 1647; Chem. Abs., 1 (1907), No. 16, pp. 2162–2164*).—The author reviews investigations made by him in 1898–99 and discusses the scientific principles and the technical processes involved in the combustion of nitrogen with oxygen and the transformation of nitrous oxid into nitric acid, as well as the cost of producing nitric acid with water power, steam, Mond gas, and blast-furnace gases.

The estimated cost per 1,000 kg. (2,200 lbs.) of anhydrous nitric acid with the different sources of power is approximately as follows: Water $32, steam $48, Mond gas $29, and blast-furnace gases $13.

The author estimates that the waste power of the blast furnaces of Europe is more than sufficient to supply the electrical energy which would be required to manufacture the sodium nitrate consumed there at the present time.

On the combustion of air, F. Russ (*Osterr. Chem. Ztg., 10 (1907), No. 17, pp. 237–243, figs. 10*).—A study of the quantitative relations of oxidation of nitrogen in the high-tension flame is reported.

A new system for the fixation of atmospheric nitrogen, F. Savorgnan di Brazza (*Sci. Amer., 97 (1907), No. 15, pp. 256, 257, figs. 4*).—The history of the development of the process of manufacture of calcium cyanamid is traced and the application of the process on a large commercial scale at Piano d'Orte, Italy, is described. The character of the product obtained, and its value as a fertilizer are also briefly discussed.

The utilization of peat for power purposes with the recuperation of by-products (*Electrochem. and Metallurg. Indus., 5 (1907), No. 10, pp. 387–389, 392, 405–407; Sci. Amer. Sup., 64 (1907), No. 1666, pp. 362, 363*).—The utilization of peat as fuel, for the production of coke, producer gas, fertilizers, and paper pulp, and for the generation of power, is discussed mainly on the basis of recent articles by A. Frank and N. Caro. There is also a brief note on the status of the peat question in the United States.

Peat in the United States (*U. S. Geol. Survey Press Bul. 298, folio*).—This is an advance notice of a chapter, by M. R. Campbell, dealing with this subject in Mineral Resources of the United States, Calendar Year 1906, which briefly reviews the condition of the peat industry in this country during 1906. Data are given regarding the extent and distribution of peat deposits and the possibilities of the utilization of peat as a fuel and for the manufacture of producer gas.

Florida rock and other phosphates for land fertilization, A. W. Thackara (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 2992, pp. 1–3*).—A brief statement is given regarding the German imports of phosphates and other fertilizing materials.

According to this statement "Germany, although a country of agricultural contrasts caused by its natural conditions, utilizes every resource it possesses to the greatest advantage. The endeavor is becoming more evident to obtain a greater raw production per acre, even at an increased expense of labor and money. In Germany to-day there is a more thorough tilling and working of the soil, greater attention is paid to the proper manuring of the ground with natural and artificial fertilizers, to systematically draining the fields, to a proper breeding of cattle, and to the rational feeding of useful stock. By these measures, together with the use of nitrogen-accumulating plants, it has become possible to make the lightest sand and moor soil productive, so that large tracts of land hitherto uncultivated are now utilized in providing food for the people. In addition to the raw materials and finished products for fertilizing purposes produced in this country, Germany imported in 1906, 27,385 tons of artificial guano, poudrette, etc., 29,157 tons of natural guano, 37,823 tons of bone meal, 193,896 tons of Thomas phosphate meal, 531,195 tons of phosphates, 78,036 tons of superphosphate, and 20,687 tons of animal blood, manure, etc." Of the 531,195 metric tons of phosphates imported during 1906, 293,119 tons came from the United States.

Phosphate deposits in the Southern States, L. P. Brown (*Amer. Fert., 27 (1907), Nos. 3, pp. 15–17, figs. 2; 4, pp. 25–27; 5, pp. 22–24*).—The extent, character, and exploitation of these deposits are described.

The mineral industry: Its statistics, technology, and trade during 1906, edited by W. R. Ingalls (*New York and London, 1907, vol. 15, pp. XXIV+931; rev. in Jour. Soc. Chem. Indus., 26 (1907), No. 17, p. 994*).—As usual, this annual contains chapters on phosphate rock and potassium salts, as well as on other mineral products of less agricultural importance.

Commercial fertilizers, J. S. BURD (*California Sta. Bul. 189, pp. 421–443*).—The results of examination of 226 samples of fertilizers and fertilizing materials inspected under the State law during the half year ended June 30, 1907, are reported in this bulletin. This is the fourth year of fertilizer inspection in the State, and it is stated that there is much evidence to show "that these systematic inspections have resulted in materially raising the standard of the fertilizers sold in the State." A comparison of the results for three years shows a constant and satisfactory decrease in the percentage of ingredients below the guaranteed composition and also in the percentage of samples below the guaranteed valuation.

Report on commercial fertilizers, 1907, E. H. JENKINS and J. P. STREET (*Connecticut State Sta. Rpt. 1907–8, pt. 1, pp. 120*).—Analyses of 652 samples of commercial fertilizers and manurial waste products examined during the year are reported and discussed with reference to variation in composition and commercial value. The fertilizers examined are classified as follows: Containing nitrogen as the chief active ingredient, 226 samples; phosphoric acid, 11 samples; potash, 23 samples; containing nitrogen and phosphoric acid, 50 samples; mixed fertilizers, 264 samples; and miscellaneous fertilizers and manures, 77 samples. A special feature of this report is a discussion of the classification and quality of cotton-seed meal sold in the State, accompanied by analyses of 199 samples. The rules regarding classification and sampling of cotton-seed meal adopted by the Interstate Cotton Crushers Association in 1907 are given. It is stated that more than 5,000 tons of cotton-seed meal, valued at $155,000, were used as a fertilizer in Connecticut during the past year.

Analyses of commercial fertilizers and Paris green, J. E. HALLIGAN (*Louisiana Stas. Bul. 97, pp. 117*).—This bulletin gives a summary of the results of analyses of 4,161 samples of fertilizers and fertilizing materials and 214 samples of Paris green examined under State law during 1906–7. The fertilizing materials examined include among others 486 samples of acid phosphates, 206 samples of bone meal, 206 samples of tankage, and 864 samples of cotton-seed meal.

Of the complete fertilizers examined none fell below the guaranty in all three of the essential elements. In the larger number of instances the deficiencies were in the nitrogen content, but when the nitrogen was below the guaranty there was generally an excess of phosphoric acid present. The deficiencies are attributed in part to poor mixing of materials.

Of the 864 samples of cotton-seed meal examined 230 fell below their guaranties. Only a small proportion of the acid phosphates fell below guaranty. Of the 206 samples of bone meal 179 met their guaranties in phosphoric acid and nitrogen, 23 fell below in phosphoric acid, and 4 in nitrogen. Out of the 206 samples of tankage analyzed 18 samples fell below guaranty in nitrogen and phosphoric acid, 92 in nitrogen only, and 8 in phosphoric acid only.

Of the 214 samples of Paris green examined all ran above the guaranty of 50 per cent arsenious oxid required by law.

Fertilizer inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 146, pp. 203–234*).—This bulletin reports analyses of samples collected by the station of about 200 brands of fertilizers licensed in 1907.

The results show "an increasing tendency to fail to maintain the goods up to their minimum guaranty. For the most part these are slight and generally in only one constituent. It also usually happens that the other constituents are in sufficient excess to preclude any idea of intention on the part of the manufacturer not to live up to the guaranty. Usually the trouble is due to incomplete mixing."

Inspection of commercial fertilizers, J. P. STREET ET AL. (*New Jersey Stas. Rpt. 1906, pp. 17–34*).—This contains a brief statement regarding the fertilizer inspection during 1906 reported in detail in Bulletins 196 and 198 of the station (E. S. R., 18, pp. 433, 821) and a compilation representing 3,462 analyses by the New Jersey Stations of 174 different materials of value for fertilizing purposes.

AGRICULTURAL BOTANY.

Nature and development of plants, C. C. CURTIS (*New York, 1907, pp. VII+471, figs. 342*).—This work is not intended as a text-book and does not follow the usual lines of such books, but is designed by the author to give the reader a point of view from which to consider the plant world. The first part is a study of the fitness and adaptation of the leaf, root, and stem of the plant to the conditions under which the plant lives and to the work which it performs. In the second part the development of plants and their classification are treated at some length.

Causes determining the distribution of plants, C. MARÉCHAL (*Ann. Gembloux, 17 (1907), No. 9, pp. 503–508*).—A study is given of some of the causes that determine the natural distribution of plants, and the author claims that attention to the same factors would prove advantageous in introducing plants into new regions. The principal factors are said to be elevation, temperature, rainfall and humidity, and character of the soil.

Factors affecting the seasonal activities of plants, D. T. MACDOUGAL (*Plant World, 10 (1907), No. 10, pp. 217–237, figs. 3*).—An account is given of investigations which are being carried on by the department of botanical research of the Carnegie Institution. Gardens are located in alpine, subalpine, and arid situations near Tucson, Ariz., at which an interchange of plants has been made to test the various factors influencing their seasonal activities.

So far as the investigations have been pursued, the forces or factors affecting vegetation are believed to be simple physical properties, and among the most important are the thermal requirements of the plants. To determine the thermal requirements of plants the author has adopted a system of measurement in which the number of hour-degrees exposure is determined for the plant, beginning with the winter solstice or with the germination of the seeds.

The internal temperature of leaves under tropical insolation, A. M. SMITH (*Proc. Cambridge Phil. Soc., 14 (1907), No. 3, p. 296*).—An abstract is given of a paper communicated by the author giving the results of investigations relating to the internal temperature of leaves. It was found that in still air, leaves when placed in the sun possessed an internal temperature of 15° C. above the surrounding air. In the shade the internal temperature varied from 1.5° below to 4° above that of the surrounding air under different conditions. Breezes of various strengths reduced the temperature from 2 to 10°.

An attempt was made to estimate the magnitude of the cooling due to transpiration, and of two sets of leaves differences averaging 2.5° were noted.

It was found that red-brown coloring matter in the leaves tended to raise the internal temperature of the leaf from 2 to 4° above similar leaves which were white or nearly so. Young colored leaves of thin texture, it is believed, would be cooler than mature green leaves of the same species, owing to more rapid loss of water, but the presence of red pigment causes their temperature in most cases to be equal to or even higher than that of the mature leaves.

The relation of phanerogamic parasites to nitrates, M. MIRANDE (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 11, pp. 507–509*).—The author has made a study of a number of phanerogamic parasites to determine if possible the causes of their parasitism. He found an entire absence of nitrates in such parasites as broom rape, dodder, etc., where the parasitism is complete, but among the hemiparasites, like Euphrasia, Rhinanthus, and Pedicularis, nitrates may or may not be present. In interpreting the results he claims that the obligate parasites being unable to utilize nitrates, must depend upon their host plants for their nitrogen supplies, which are taken up as combined organic nitrogen by the haustoria.

The association of Pseudomonas radicicola with Bacillus ramosus, W. G. Sackett (*Rpt. Mich. Acad. Sci., 8 (1906), pp. 147–150*).—The author calls attention to the fact that in preparing and developing liquid cultures of tubercle-forming bacteria it frequently happens that during the growth of the germs there is a fermentation set up which is not typical of *P. radicicola*. An examination of the material shows quite frequently bacteria of the *B. ramosus* type.

A series of investigations was undertaken to determine the antagonism which exists between different soil bacteria and the germ producing the nodules of the alfalfa plants. Cultures were made in which *P. radicicola* from alfalfa and *B. ramosus* were employed. An examination of the four series shows that where the alfalfa germs were grown in pure cultures there was always an increase in their number throughout the experimentation period. Where the alfalfa germs and *B. ramosus* were associated in the same flask, the alfalfa organisms did not in a single instance show any growth, while *B. ramosus* did grow and multiply, although in greatly reduced numbers as compared to the growth in pure cultures.

The relation of certain biological principles to plant breeding, E. M. East (*Connecticut State Sta. Bul. 158, pp. 93, figs. 6*).—This is a critical summary of the most important theories and principles of variation, evolution, and heredity, with especial reference to their practical bearing on the methods of breeding farm crops. The bulletin is designed to give the practical breeder an introduction to the theoretical side of the subject. An extended discussion is given of the methods and technique of plant breeding, in which the author attempts to point out what appear to be the advantages and shortcomings of the different methods.

The author summarizes the present status of our knowledge regarding the subject of inheritance and hybridization as follows:

"(1) Organisms are composed of numbers of characters which are inherited as units. These units are inherited by definite laws of which Mendel's law is the first to have been discovered. Since these characters are inherited as units it is most reasonable to suppose that each one has been originated fully formed, i. e., as a mutation. The addition of a new unit character is the only real difference between this mutating organism and its progenitors, and is the true and only foundation for domestic improvement.

"(2) The object of hybridization is to shuffle and recombine these unit characters. Hybridization, therefore, actually produces nothing new in spite of its wonderful manifestations. Just as chemical units—the elements—can be combined and recombined into different compounds, so can the unit characters of organisms be combined and recombined by hybridization.

"(3) The value of the selection of fluctuations is slightly to increase or to decrease the manifestations of a unit character after it has been formed by nature. Selection can never produce a unit character, for there is obviously no basis upon which it could work."

This bulletin will be found to be a most valuable summary and statement of the principles underlying plant breeding, much of the literature of which is not generally available.

Degeneration in potatoes, G. Massee (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1907, No. 8, pp. 307–311, pl. 1*).—The author states that in the past few years many inquiries have been made as to the reason why potato tubers fail to form sprouts even when placed under the most favorable conditions. This phenomenon is known to occur not only in England, but also in Germany and France, and a study extending over 3 years has resulted in the conclusion that the failure to sprout is due more or less to the arresting of the development of the vascular system of the tuber, and to the comparative absence of diastase.

The imperfect development of the fibrovascular system of the tuber is said to be mainly due to the desire to obtain a potato with an even surface, and selections have been made with this point in view, but at the expense of the germinating power.

In other instances it was found that accumulated starch was not utilized, which indicated a lack of diastase. Studies were made which indicate that the amount of diastase may be increased by the use of superphosphates, and that it is produced more abundantly in light than in darkness and at a high rather than a low temperature.

In connection with this investigation, tubers that had failed to produce sprouts under the most favorable conditions available to the ordinary grower were placed in a forcing pit having a temperature averaging 70° F. and left uncovered. After a time sprouts were formed freely at the apical end of the tubers in all the eyes, and when planted the potatoes yielded an abundant crop of normal potatoes.

Report of assistant in botany, R. Y. WINTERS (*Florida Sta. Rpt. 1907, pp. LIII-LVI*).—The principal investigations reported are on the fermentation of kaki or Japanese persimmon, celery blight, and lettuce drop.

The fermentation experiments with the Japanese persimmon were made in glass jars, following in the main the Japanese method for fermenting these fruits. Absorbent cotton saturated with alcohol was placed in the bottom of each jar, over which was put a glass plate to keep the fruit from coming in contact with the alcohol. Carefully selected fruits were then placed in the jar, and the whole covered with a second glass plate. The fruit was observed from time to time and at the end of 9 days was examined.

It was found that in the check lots no external change had taken place, except a gradual ripening shown by the darkening of the fruit, which still retained considerable of the astringent flavor. Among the fruits treated, those which were the firmest when placed in the jars were in the most excellent condition and at the end of 16 days had kept much better than riper fruit. The flavor was greatly improved, the fruit was free from astringency, and a pleasant subacid flavor had been developed. These experiments show that the fruit is improved by this fermenting process, and that fresh firm fruit free from bruises should be used.

The celery blight or blackheart, due to *Bacterium apii* (?), and the lettuce drop caused by *Sclerotinia libertiana*, are briefly described.

FIELD CROPS.

A successful Alabama diversification farm, M. A. CROSBY, J. F. DUGGER, and W. J. SPILLMAN (*U. S. Dept. Agr., Farmers' Bul. 310, pp. 34, figs. 4*).—This bulletin gives an account of the first 3 years' work in diversified farming on a certain plantation in Alabama. The operations for each year are described and the receipts and expenditures are given. In 1904, alfalfa, corn, cowpeas, cotton, melilotus, and sorghum; in 1905, alfalfa, winter barley, corn, cowpeas, and sorghum; and 1906, corn, cowpeas, alfalfa, sorghum, and peanuts were grown.

The plan of rotation and the arrangement of fields are discussed. The rotation was planned with a view to improving the soil and to growing crops for the maintenance and fattening of hogs. The results of the 3 years' work are taken as indicating that the method of diversified farming followed can be made profitable in the South wherever alfalfa grows successfully.

The average net profit per acre for the 3 years on this farm was $11.37, but if rental of $3 an acre is allowed the profit is cut down to $8.37 per acre. It was observed that the brown and reddish brown soils are not nearly as well adapted to alfalfa culture as the black and gray soils. The results for 1906 showed that a well-set alfalfa field the second year from sowing will furnish pasture for 12 to 15 hogs to the acre from April 1 to October 1, and at the same time produce 1½ tons of hay per acre. The first year, when the rows of corn were laid out with the contour of the land and cultivated only one way, the cost of cultivation of the corn averaged $1.38 per acre and the cost of haying 70 cts., but in 1905 and 1906 when the corn was check-rowed and cultivated both ways this was reduced to $1.10 and 21 cts., respectively.

A successful southern hay farm, H. Benton (*U. S. Dept. Agr., Farmers' Bul. 312, pp. 15*).—In the discussion of the management of this farm the cultural methods used in connection with growing crimson clover, oats, corn, and cowpeas are described.

Forage crop experiments, G. A. Billings (*New Jersey Stas. Rpt. 1906, pp. 270–297, pls. 9, dgm. 1*).—Soiling crops were grown in rotation and a yield of 225.56 tons of green forage was secured, which furnished feed to 35 adult and 12 young animals 142 days. A summary of the results is given in the following table:

Cost of the forage crops and the total nutrients in the forage.

Kind.	Tons.	Cost.					Total nutrients.		
		Seed.	Manures and fertilizers.	Labor.	Total.	Average per ton.	Protein.	Fat.	Carbohydrates.
							Lbs	*Lbs*	*Lbs.*
Rye	20.70	$6.80	$15.00	$19.35	$40.65	$1.96	952.2	228.4	7,907.4
Wheat	19.43	6.60	5.00	41.91	26.51	1.36	931.2	271.6	6,906.4
Grass	19.25	....	16.50	22.00	38.50	2.00	1,347.0	308.0	5,274.0
Alfalfa	22.46	....	11.31	14.00	25.31	1.13	2,025.0	405.0	7,830.0
Jap. barnyard millet	26.10	5.35	23.01	25.15	53.51	2.05	783.0	312.2	7,621.2
Thor. White Flint corn	12.40	.66	9.63	11.45	21.74	1.75	421.6	148.8	4,092.0
Southern White corn	11.50	.45	10.92	10.58	21.95	1.91	345.0	230.0	5,290.0
Kafir corn and cowpeas	12.60	2.56	10.52	11.40	24.48	1.94	630.0	176.4	3,099.6
Variety experiment plat	7.00	1.80	4.47	7.86	14.13	2.02	196.0	70.0	2,114.0
Cowpeas	53.78	19.56	39.65	57.65	116.86	2.16	3,334.4	752.9	13,068.2
Second-crop grass	20.34	....	16.50	12.00	28.50	1.40	894.9	264.1	5,369.8
Total	225.56	43.28	157.51	206.35	412.14	1.82	11,860.3	3,168.4	68,572.6

The first heads of rye appeared May 2, at which time cutting and feeding began. The yield from 5 acres averaged only 4 tons per acre, although 3 acres were top-dressed with manure in the winter. Wheat made an excellent growth in early May and yielded over 6 tons per acre with no top dressing. Planted after corn and cowpeas with no manurial treatment wheat produced a yield of 7.5 tons per acre. The influence of the cowpeas was very marked.

Barnyard millet matured a crop 54 days after planting and yielded 7.7 tons of green forage per acre. On alfalfa sod barnyard millet sown at the rate of ¾ bu. per acre produced 14.3 tons of green fodder. Thoroughbred white flint corn was planted June 14, after cutting a crop of wheat for green fodder, and produced well-matured ears at the rate of 102 bu. to the acre. After Crimson clover, made into hay, a yield of 92 bu. per acre of sound corn was secured. The corn was planted in rows 3 ft. apart but quite thickly in the row, yet nearly every stalk matured a good ear and a yield of 12.4 tons of green fodder per acre also compared favorably with coarser varieties for fodder. Twelve pounds of Kafir corn and 1¼ bu. of Red Ripper cowpeas per acre, planted June 19, yielded 12.6 tons of fodder 78 days after planting. It is believed, however, that Whippoorwill and Black cowpeas would make a better combination with Kafir corn on account of their earlier maturity. Cowpeas planted broadcast July 16 yielded 6.3 tons of green forage per acre, and where planted in rows 2¼ ft. apart 7.5 tons were secured, but the difference in yield was so offset by the increased cost of labor that the cost of production by the two methods was about the same.

Average yields of alfalfa in various tests, ranging from 2.83 tons to 4 tons per acre, are recorded. An application in November, 1905, of 25 bu. of stone lime freshly slacked resulted in a marked improvement of the alfalfa crop the following year. Experiments with alfalfa seed from different sources showed that in total yield from 3 cuttings the seed from Utah stood first, Kansas (No. 13,439) second, and Minnesota third. A comparison of seed from foreign countries showed wide variations in the vigor of the crop. The best yield was secured from a sample from Italy, numbered 13,547. The use of cotton muslin hay caps, 45 by 45 in., with corners weighted down by 2 oz. unthreaded bolt nuts, resulted in every case in a decided difference in the quality of the hay as compared with leaving the heaps uncovered.

Crimson clover sown in July, 1905, gave yields the following year ranging from 1.28 to 2.3 tons of hay per acre. Early Champion and White Spring oats were sown together with Scotch Green peas. The cost of production of hay on different plats varied from $3.83 per ton to $7.51.

In a corn fertilizer experiment one plat was fertilized with 400 lbs. of basic slag, 200 lbs. of nitrate of soda, and 150 lbs. of muriate of potash per acre, a second plat with 200 lbs. of nitrate of soda, 100 lbs. of ground bone, 350 lbs. of acid phosphate, and 150 lbs. of muriate of potash, and a third plat with 200 lbs. each of nitrate of soda and Peruvian guano, 100 lbs. of ground bone, 200 lbs. of acid phosphate, and 150 lbs. of muriate of potash per acre. The first plat yielded 14.53 tons per acre, the second 13.75 tons, and the third 12.27 tons, the cost per ton for the 3 plats being $1.14, $1.27, and $1.44, respectively. It is concluded that basic slag produced very satisfactory results.

In determining the cost of silage from Southern white corn, it was found that the cost per ton for growing the fodder was $1.43 and for cutting and filling the silo $1.12, or a total of $2.55 per ton of corn silage. Records of yield, cost of production, and net income from 76 acres show a cost of $1,917.49 and a value produced of $3,024.51, or a net gain of $1,107.02.

Notes are given on an experiment with vetches and lupines and with seeds of root crops from Denmark. Of the Danish seed, Yellow Olive-shaped Giant mangold and Danish Stensballe and Danish Champion carrots gave promising results.

The Essex field experiments, 1906, B. W. Bull and V. H. Kirkham (*Essex Ed. Com., County Tech. Labs., Chelmsford, 1907, Apr., pp. 26, pls. 2, dgm. 1*).—Among the 7 varieties of wheat under test Wilhelmina ranked first with a yield per acre of 49.7 bu., this being 2½ bu. more than the yield of Rivett. No great difference in the yield of straw was observed but the quality of straw was superior in Browick.

Yellow Globe, Long Red and Golden Tankard mangels were grown by 3 different parties. Yellow Globe gave an average yield per acre of 27 tons 1.5 cwt., Long Red 25 tons 5 cwt., and Golden Tankard 22 tons 13.5 cwt. The average dry matter content was 9.42 per cent in Yellow Globe, 10.97 per cent in

Long Red, and 10.95 per cent in Golden Tankard, and the sugar content was 4.25, 5.13, and 4.98 per cent respectively. The inferior quality, indicated by these figures, is attributed to seasonal conditions. The results of fertilizer experiments with mangels seem to indicate that barnyard manure and superphosphate increases the quantity without deteriorating the quality, that nitrate of soda increases the yield but lowers the quality (although an actual increase of dry matter and sugar was obtained), and that salt so reduces the quality that the actual amount of nutritive material per acre is probably reduced. It was found that the cost of producing dry matter in mangels was lower when barnyard manure or commercial fertilizers were used alone than when they were used together, but the residual value of the applications must decide which produces dry matter at the lower cost.

Five varieties of sugar beets grown in one test gave an average yield of 22.2 tons per acre. Vilmorin Improved ranked first in yield and quality in this as well as in the preceding year.

A fertilizer experiment with peas showed that 10 tons of barnyard manure per acre was as effective as 15 tons. An application of 5 cwt. each of superphosphate and kainit and 1 cwt. of nitrate of soda gave a slightly better yield than the lighter application of barnyard manure.

A comparison of 4 grades of basic slag showed that the 35–38 per cent grade gave the best results when the 4 grades were used in equal quantities.

Field experiments at Lauchstädt, W. SCHNEIDEWIND ET AL. (*Landw. Jahrb., 36 (1907), No. 4, pp. 569–676, 738–743, pls. 5*).—The sixth report of the station, presenting the results secured in 1904 to 1906, inclusive. Earlier results have been previously noted (E. S. R., 16, p. 454). Fertilizer and variety tests are reported and the results are given in tables, together with detailed discussions.

It was observed that on the station soil a dry year following either a normal or a wet season will produce a high yield of grain with a low yield of straw, provided the scanty precipitation is properly distributed. Potatoes also gave good yields under these conditions, but beets in continued dry weather were a complete failure. In dry seasons early varieties gave higher yields than late varieties, but this difference was not very marked among varieties of spring barley. During seasons of low rainfall Groning winter barley, an early variety, gave considerably higher yields than Bestehorn Giant, a late maturing sort, and the early ripening Ligowo oats produced more grain than the late ripening Strube. Hungarian and American varieties of wheat gave much better returns than the squarehead sorts. Late ripening and starchy varieties of potatoes were less productive than earlier varieties.

With reference to quality it is stated that the small yields of grains secured in dry years are richer in protein, and that root crops contain more carbohydrates and protein than the larger yields secured in moist seasons. Lodged grain in wet years is an exception to this rule, as this is often high in protein in connection with heavy yields. Attention is called to the fact that no great difference in sugar content in the sugar beet occurs as a result of wet and dry seasons, and that a high protein content in brewing barley is undesirable.

To reduce the loss of nitrogen in barnyard manure during storage it is advised to make a base 15 to 20 cm. high of older manure in a thorough state of fermentation, upon which the fresh manure is spread as made. It is explained that carbon dioxid in large quantities is formed in the old manure, which is not the case in fresh manure, and that this gas retains the ammonia. As the lower strata of the fresh manure deposited grow older these begin to form their own carbon dioxid. By this method the losses of nitrogen in manure under cover were reduced from 30.31 to 16.94 per cent. The use of gypsum in quantities amounting to about 5 per cent of the manure reduced the loss of nitrogen to some extent, but owing to the large quantities required and the sulphur compounds formed as the result of reduction processes and which are injurious to plant growth, gypsum is not recommended as a preservative for barnyard manure.

The most complete preservation of barnyard manure was secured by separating the liquid substance and preserving it by itself, while the solid manure was allowed to rot with water. This method is not opposed to the old rule that manure should be kept moist and compact, but rather accords with it as in both cases losses are prevented by excluding the air from the liquid substance. Furthermore, when liquid manure is stored separately the organisms which act injuriously are not at all, or but slightly, active on account of the lack of carbon which in mixed manure is so abundantly supplied by the solid excrement and the litter.

The nitrogen derived from green manuring was well taken up by beets and oats, while potatoes on the better soils were very irregular in using this supply of plant food. It is stated that as a result of the cultivation of the potato crop, which is similar to fallowing the land, so much nitrogen is made available on fairly fertile soils that this covers the requirements of the crop and that consequently little use is made of the nitrogen which may have been supplied by green manuring. The certainty with which barnyard manure proves advantageous to the crop is attributed largely to the potash content of the manure. A mixture of peas and beans grown after a crop of early spring barley and winter barley, and rye sown with clover, especially yellow clover (*Trifolium agrarium*), gave the best results in green manuring.

The tests with commercial fertilizers showed that nitrate of soda was best adapted to most crops, although potatoes used ammonia with equally good results. Norwegian calcium nitrate was equally effective with nitrate of soda, while lime nitrogen showed about 80 per cent of the effectiveness of nitrate of soda. These different substances, however, were not utilized with equal readiness by all crops, potatoes and cereals making better use of them than beets. It was also found most profitable in the culture of winter cereals to apply all of the nitrogen in the form of nitrate of soda in the spring.

A rotation consisting of fallow, rape, wheat, rye, oats, and oats showed a deficit of 225.69 marks per hectare (about $22 per acre) at the end of the 6 years as compared with a rotation in which a crop of peas was substituted for the fallow. In a second rotation experiment fallow, wheat, beets, barley, and oats as a crop succession gave at the end of the 5 years a return of 225.62 marks per hectare less than a rotation including peas in place of the fallow.

The inoculation of horse beans, peas, and alfalfa with pure cultures remained without effect, while the inoculation of serradella, a crop not theretofore grown by the station, was of much benefit to the crop. Seed treated with Issleib nutrient solution gave no better results than seed soaked in water.

In the variety tests with wheat the best yields were obtained from Jaensch White, Strube squarehead, and Rimpau squarehead wheats. The successive culture of these varieties for 3 years gave no indication of degeneration. Protein and gluten content varied very much in the different years, the foreign and spring wheat varieties ranking first in this respect. The content of the nitrogenous nonglutenous substances in the grain of the same year was almost exactly the same, so that differences in protein content were due to differences in the gluten content.

Baking quality was found less dependent upon the variety than upon season, time of harvesting, lodging, etc. It was also shown that a high gluten content does not control the baking quality exclusively, but that the quality of the gluten itself may be a strong factor in this regard.

During the wet season of 1906 a heavy application of nitrogenous fertilizer reduced the baking quality, while in the dry season of 1904 the same fertilizer treatment improved it. The statement is made that when the use of nitrogenous fertilizers has reduced the baking quality of wheat an improvement may be brought about by storing the wheat for some time. The baking quality of fresh wheats may sometimes be improved by drying at 40 to 50° C. It is further indicated that up to a certain point the addition of the sugars exerts a beneficial effect on the baking quality.

Among the varieties of winter rye grown Petkus and Heine Zeeland gave the best results, and of the winter barley varieties Bestehorn Giant ranked first in moist seasons and Groning, an earlier sort, in dry seasons. Svalöf Hannchen spring barley has given the best results during the last few seasons, but otherwise the Chevalier varieties ranked first in some years and the Hanna varieties in others. The best results of different varieties of oats during the last years of the test were secured from Ligowo. The third generation of oats was as productive as the original seed.

In studying the plant-food requirements of plants it was found that so far as quantity is concerned there were no great differences between varieties of the same crop, but it was observed that the Hungarian and American wheats were not only richer in protein but also required larger quantities of soil nitrogen, although giving smaller yields than the domestic varieties, which, in turn, required greater quantities of potash.

The highest yields of tubers and starch of the different varieties of potatoes compared were secured from Silesia and Leo, while the highest percentage of starchy substance was found in Fürst Bismark. These are late ripening sorts and in dry seasons their superiority over the earlier sorts was less, or not at all, apparent. Ella, a yellow-fleshed table potato, ranked first in cooking quality.

Late ripening varieties of sugar beets produced no higher yields of sugar than earlier sorts. The late varieties are said to produce higher yields of roots than the early varieties, but owing to a lower sugar content no higher absolute yield of sugar is secured. Among different fodder beets Eckendorf produced the highest yield of roots, and Vilmorin Half-sugar and Mohrenweis Veni Vidi Vici the highest yields of dry matter. Great differences in the yield of dry matter, however, were not found. The sugar beet produced about the same quantity of dry matter as the fodder beet, and if the leaves of both crops are taken into consideration, the higher yield of dry matter.

Brief sketch of the experiments on the Poltava experiment field from 1886 to 1905, S. P. TRETYAKOV, G. N. NAZAROV, and K. L. VERBETSKI (*Abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 1, pp. 73–75*).—The results on different kinds of fallow showed in general that the earlier the fallow field was plowed the greater was the yield of winter cereals. This was not the case on black fallow, which, though plowed much earlier than April fallow, gave in the mean for 11 years a lower yield of winter wheat and winter rye than April fallow. The lowering of the yield on black fallow manifested itself a number of years after an experiment with a three-course rotation had been begun. A vetch mixture grown on the fallow diminished the yield of the succeeding winter crops, but it more than compensated for this loss by the yield of fodder produced.

The application of manure on late fallow was not so effective as on early fallow, and the yield of winter grains was greater where the manure was plowed under at once than where it was left on the field for a month or more before plowing. Early fall plowing increased the yield of spring-sown cereals.

Wagga experimental farm [report], G. M. McKeown (*Agr. Gaz. N. S. Wales, 18 (1907), No. 2, pp. 159–162, fig. 1*).—Comparative fertilizer tests with alfalfa resulted in the obtaining of the best yield from the use of 2 cwt. of superphosphate per acre on limited land. The addition of ½ cwt. of sulphate of potash to the superphosphate did not benefit the yield.

Of the number of different varieties of wheat, Farmers Friend ranked first with an average yield per acre of 21 bu. and 22 lbs. for the varieties grown for 7 consecutive years. Sowing at the rate of 60 lbs. per acre gave better average yields than the use of either 20 or 40 lbs. of seed. Superphosphate proved a more efficient fertilizer than bone phosphate. Drilled seed for 4 years gave an average yield of 20 bu. and 20 lbs. per acre, as compared with 17 bu. and 57 lbs. for seed sown broadcast.

The general average yield per acre of a number of varieties of barley was 25 bu. and 20 lbs., and the average of the 3 best varieties 27 bu. and 12 lbs. The best yields in a fertilizer experiment were secured by applying ½ cwt. of superphosphate and ½ cwt. of sulphate of potash per acre.

The time of farm operations at Aas Agricultural College, G. Holtsmark (*Ber. Norges Landbr. Höiskoles Virks., 1905–6, pp. 113–115*).—Farm records kept at the college since 1859 show that the time of plowing and harrowing at Aas in southern Norway generally falls between April 21 and May 3, the average date being April 27; the first sowing of barley, peas, and vetches between May 3 and 12, with the average date May 7; the first sowing of turnips between May 30 and June 7, the average being June 3; the beginning of haying between June 30 and July 9, the average being July 4; the harvest of the last hay between July 24 and August 11, with the average August 2; the end of the turnip harvest between October 26 and 29; and the end of the fall plowing between November 5 and 21, the average date being November 13.

A contribution to the knowledge of the germination of grains, J. Effront (*Bul. Assoc. Chim. Sucr. et Distill., 1905, p. 508; Ann. Gembloux, 1906, p. 259; abs. in Zentbl. Agr. Chem., 36 (1907), No. 5, pp. 320–324*).—Experiments were conducted to determine the relation between the saccharifying and the starch-splitting enzyms.

It was found that the period of activity of the saccharifying ferment may be divided into 4 periods, in the beginning a rapidly increasing activity followed by a reduced working power, and again a renewed activity, which finally gives place to a gradual but continuous decline. The starch-splitting ferment, on the other hand, showed a progressive increase in activity. The maximum of activity of these 2 enzyms was not reached at the same time and the length of the plumule had apparently no direct relation to their maximum working power.

The action of direct light upon the grains while germinating had an injurious effect upon the saccharifying ferment, while the starch-splitting enzym was not so influenced. The influence of chemical reagents was quite varied, retarding or preventing in some cases germination itself and in others the development of the enzyms in question. Hyperchlorids in neutral solution favored germination and the development of diastase. The quantity of diastase formed during germination is directly dependent upon the quality of the barley and also stands in direct relation to the duration of germination and the length of the plumule. The diastase formed during the process of germination remains entirely with the proteids.

A hybrid from teosinte and corn, P. L. de Vilmorin (*Bul. Soc. Bot. France, 54 (1907), No. 1, pp. 39–42, pl. 1*).—This article discusses and describes the hybrid obtained by pollinating the female flowers of teosinte with pollen from a small white variety of corn. The actual work of hybridizing was done by G. Laurent. The application of pollen from teosinte on the female blossoms of corn gave no results. As the result of xenia, some of the grains were complex and in some instances were joined together in pairs.

Brewing barley from a scientific and practical standpoint, P. Bauer (*Wchnschr. Brau., 24 (1907), Nos. 19, pp. 249–255; 20, pp. 261–266; 21, pp. 273–276*).—As a result of his observations the author advises for early sowing the use of a variety of barley low in protein, with a fully developed kernel, strong in germination, and one which produces a strong stem with comparatively few joints. The use of nitrogenous fertilizers in minimum quantities is recommended and it is believed that barley should occupy the third or fourth place in the rotation. When barley must be grown as the second crop in the rotation a heavy and timely application of lime, potash, and phosphoric acid with common salt should be made. High yields of first quality are considered possible only when the soil is supplied with all the plant food elements. It is stated that potash and sodium tend to increase starch and sugar and to decrease protein in the grain, while lime and phosphoric acid strengthen the stem and thereby reduce the danger of lodging.

Cotton fertilizer experiment, A. W. Blair (*Florida Sta. Rpt. 1907, pp. XXIV–XXVI*).—The standard application per acre used in this work consisted of 200 lbs. of acid phosphate, 150 lbs. of cotton-seed meal, and 50 lbs. of muriate of potash. The plat receiving this application produced at the rate of 465 lbs. of seed cotton per acre, while the plat receiving no fertilizers produced at the rate of 122½ lbs. A plat receiving one and one-half times the standard formula yielded at the rate of 615 lbs. of seed cotton per acre, but when the standard amount was doubled the yield was not quite so good as with 600 lbs.

The author believes that from 400 to 600 lbs. per acre of a good complete fertilizer is the most profitable quantity to apply, and that the results have shown that the practice of applying 100 to 200 lbs. of a one-sided fertilizer to cotton in Florida is poor economy.

Manuring of seeds hay, W. Allan (*Edinb. and East of Scot. Col. Agr. Bul. 13, pp. 17, dgm. 1*).—Cooperative fertilizer experiments on hay lands were carried on for 3 consecutive seasons at 51 centers.

The fertilizing ingredient producing the largest weight of crop was nitrogen. Equally good results were secured from nitrate of soda and sulphate of ammonia, and the best results from a mixture of the two. The largest applications of nitrogen gave the heaviest crops and the best financial returns. The results secured indicate that the following application per acre is most likely to give general satisfaction: ⅞ cwt. of 95 per cent pure nitrate of soda, ⅝ cwt. of 95 per cent pure sulphate of ammonia, 2½ cwt. of 30 per cent soluble superphosphate, and ⅞ cwt. of 55 per cent pure sulphate of potash.

Irrigation of meadows, Stodolski (*Abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 1, pp. 78, 79*).—It is recommended that meadows be irrigated in the fall when the drainage and river waters are especially rich in fertilizing material, and it is stated that irrigation in the spring and summer, which merely supplies the plants with moisture, should be done during the night or on cool cloudy days in order to avoid injurious effects of sudden changes of temperature. Irrigation of meadows is sometimes practiced during the winter to destroy moss and weeds.

Fertilizer tests of lime nitrogen in comparison with nitrate of soda on hops in 1906, Wagner (*Vrtljschr. Bayer. Landw. Rat., 12 (1907), No. 1, Sup.,* *pp. 200–204*).—The lime nitrogen used in these tests contained 19.5 per cent of nitrogen and the nitrate of soda 15.5 per cent. A summary of the results is given in the following table:

Increase in yield and value of hops per hectare from the use of different quantities of lime nitrogen and nitrate of soda.

Fertilizers applied.	Quantity per hectare.	Increase in yield per hectare.	Value of increased yield per hectare.	Cost of fertilizer per hectare.	Net profits per hectare.
	Kg.	*Kg.*	*Marks.*	*Marks.*	*Marks.*
Lime nitrogen	318	151.5	212.1	95.5	116.6
Nitrate of soda	400	200.0	280.0	95.5	184.5
Lime nitrogen	517	200.0	280.0	155.2	124.8
Nitrate of soda	560	257.5	360.5	133.7	226.8

The hardness of the seed coats in Leguminosæ, L. HILTNER and W. KINZEL (*Zentbl. Agr. Chem., 36 (1907), No. 6, pp. 381–384*).—Observations on the hardness of the seed coats in a number of leguminous crops are reported. It is stated that red clover seed generally contains from 5 to 10 per cent of kernels having hard seed coats, but that in the year 1895 many samples were found which contained as high as 60 per cent. This result is taken as indicating that weather conditions at the time of ripening have a great influence on the texture of the seed coat.

It was also found that hardness in the seed coat in some species may be increased artificially by subjecting the seed for a considerable time to a dry heat of 30 to 40° C. By drying the seeds of lupines, peas, vetch, beans, sainfoin, and red clover for 8 days at a temperature of 35° the hardness of the seed coat was considerably increased, as shown in subsequent germination tests. Untreated samples swelled quite readily and germinated within a few days, while the dried samples remained impervious to water for a long time and consequently germinated very slowly. The seed coats were also hardened by drying the seed over concentrated sulphuric acid.

In a similar test seeds of peas and lupines were dried at a temperature of 105°. All the grains of an untreated sample of lupine seed swelled in 3 hours, while of those subjected to a heat of 105° C. for 4 hours 14 swelled after 18 hours, 5 more after 24 hours, and 49 more after 10 days. On the other hand, the resistance to moisture in a sample of lupine seed with extremely hard seed coats was very much reduced by heating. It is stated that this was due to a breaking up of the seed coat after this had reached its maximum point of contraction.

In the laboratory it was observed that in a sample of vetch seed the number of seeds with hardened seed coats had increased from 15 to 25 per cent after standing in open glass jars for several weeks. It was also found that the hardness of the seed coats of clover may be reduced by shaking in a glass jar, and it is concluded that such seed when stored in large heaps may be improved by frequent handling with the shovel.

A sample of clover seed, which had been stored for 8 years, was separated into the kernels which had remained unchanged, those which were light in color but had slightly darkened, violet darkened grains, and those which had become brown and more or less shriveled. Of the kernels of normal appearance 10.5 per cent germinated, 81.9 per cent remained hard, and 7.6 per cent decayed, while in the other samples the percentage of germination ranged from 1.7 to 8.1 and the percentage of decayed seeds from 33.4 to 95.2. All the seeds which had not swelled after 10 days were treated to overcome the resistance of their seed coats and nearly all of them after this treatment were capable of germinating.

Pentosans in the soy bean, G. BORGHESANI (*Staz. Sper. Agr. Ital., 40 (1907), No. 2, pp. 118–120*).—Analyses of 5 varieties of soy beans showed that the Yellow Giant stood lowest in pentosans with a content of 2.86 per cent, and the black soy bean highest with 3.86 per cent. The cellulose content of these 2 varieties was 4.68 per cent and 4.40 per cent, respectively.

Sugar-cane experiments in the Leeward Islands, 1905-6, F. WATTS ET AL. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1905–6, pt. 2, pp. 54, dgms. 5*).—This publication contains a report on fertilizer experiments with sugar cane conducted at Antigua and St. Kitts in the season 1905–6. The trials with plant canes have been carried on for 6 years and with rattoon canes for 5 years. The results given are based on a repetition of each experiment 58 times with plant canes and 39 times with rattoon canes.

It is shown that commercial fertilizers are unprofitable for plant canes on thoroughly tilled land which has received about 20 tons of good barnyard manure per acre. The results appear so definite that it has been decided to close this series of experiments with plant canes.

The tests with rattoon canes have been divided into 2 series, the one, known as the old series, which has already received an application of commercial fertilizers as plant canes, and the other, the new series, which has not received any commercial fertilizers as plant canes. The results on the old series of tests, which has now been carried on for 5 consecutive years, show that nitrogenous manures are essential and profitable in the successful growing of rattoon canes. Nitrogen in a quick acting form, such as nitrate of soda or sulphate of ammonia, should be given alone in one application at a fairly early stage of growth.

The new series of tests has been in progress but 1 year and no reliable results have as yet been secured.

Cultivation of tobacco in Hawaii, J. G. SMITH and C. R. BLACOW (*Hawaii Sta. Bul. 15, pp. 29, pls. 3, figs. 4*).—The discussions on the culture of tobacco in Hawaii presented in this bulletin are based on the result of 3 years' work undertaken to demonstrate the possibility of the production of tobacco on a commercial scale in the islands. Complete directions are given for the construction and management of curing barns and seed beds and on the methods of field preparation, transplanting, topping, suckering, harvesting, sorting, fermenting, baling, and marketing.

The station reports the following yields per acre: Cuban filler tobaccos grown from seed brought directly over from Cuba, 600 to 1,200 lbs. of leaf, Sumatra tobaccos from seed direct from Sumatra, 900 to 1,200 lbs., Cuban tobacco from seed grown 2 or 3 years or more in Hawaii, 900 to 1,400 lbs., and the second, third, and succeeding generations of Sumatra grown in Hawaii, 1,200 to 2,000 lbs. All of these types showed improvement in quality, and the results of 3 years' work in Hamakua show a remarkable increase in the percentage of wrapper leaves the third year over that produced by plants from seed imported direct from either Cuba or Sumatra. It is believed that with full stands and a favorable season 30 per cent of either the Cuban or Sumatra tobacco will produce high-grade wrappers, and that this percentage can be materially increased.

It is stated that the best tobacco districts in Hawaii are in the cloud belts on the slopes of the higher mountains, wherever there is sufficient rainfall, and that tobacco of good quality can be grown in the Hamakua, Hilo, Olaa, Puna, Kau, and Kona districts on the island of Hawaii, in the Kula, Makawao, and Kolau districts on Maui, and in similar areas on the islands of Lanai, Molokai, Oahu, and Kauai.

Improvement of Virginia fire-cured tobacco, G. T. McNess, E. H. Mathewson and B. G. Anderson (*U. S. Dept. Agr., Bur. Soils Bul. 46, pp. 40, pls. 6, figs. 2*).—The subject-matter of this bulletin has been abstracted from another source (E. S. R., 19, p. 335).

HORTICULTURE.

Report of the horticulturist, G. F. Warren and Jennie A. Voorhees (*New Jersey Stas. Rpt. 1906, pp. 189–223, 237–242, 248–265, pls. 7*).—In addition to the continuous investigations conducted on the permanent plats with orchard and small fruits and asparagus, the work for 1906 included spraying and fumigation experiments, which are elsewhere noted, work in asparagus breeding, vegetable forcing investigations, and other special studies. The data secured in these various lines of work, together with meteorological data for the year are given in this report.

Records have been kept at the station since 1896 to determine the amount of plant food used by apples, pears, cherries, plums, peaches, quinces, and asparagus. Two trees each of the plum and the pear and one each of the other fruits are included in the test. The leaves, prunings, and fruit have been weighed and analyzed each year. The work with the peach tree was completed in the fall of 1905 by removing the tree and weighing and analyzing the roots, and the complete tabulated results covering a period of 10 years, a summary of which has been previously published (E. S. R., 18, p. 442), are given and discussed in this report. Tables are also given showing the 10 year average composition of leaves and prunings and of their ash of the other kinds of fruits studied.

In the work with asparagus 2 varieties were used, viz, Palmetto, grown on 4 differently fertilized plats, and Columbian Mammoth White, grown on an irrigated and an unirrigated plat. The plats contained 1/216 acre each. The soil was a stony loam of medium fertility. Tables are given showing the yield and composition of the asparagus tops and the plant food removed by them during a period of 8 years, the composition of and plant food removed by the edible portion in 1901, and the estimated plant food removed annually per acre by the 4 plats of Palmetto.

The edible portion of the asparagus was found to be relatively rich in phosphoric acid, removing over twice as much for each pound of nitrogen or potash removed as the tops, whereas the latter removed over four times as much nitrogen and potash and about twice as much phosphoric acid as the edible portion. From the data secured it is suggested that more phosphoric acid and potash may be applied in asparagus fertilizers than is needed, especially where the tops are burned on the bed. No striking effects of the different fertilizers are shown by the analyses except with the plat fertilized with yard manure, where the potash percentage is considerably higher. Larger applications of potash and nitrogen appear to have slightly increased these substances in the tops. The average composition of both varieties was practically the same. Heavy rainfall during the growing season appeared to lower the percentage of nitrogen in the tops and increase that of potash. The same effect was noted in the irrigated plat.

With the view of securing a superior rust-resistant strain of asparagus, seed was secured from 36 different sources and selections were also made from rust resistant as well as rusted plants for comparison from different parts of New Jersey. The work of selection will be continued among the resulting plants.

A further report is given on the fertilizer, irrigation, and variety tests of small fruits and vegetables (E. S. R., 18, p. 38). The tabulated data given and discussed show the yields of asparagus, blackberries, raspberries, currants, and gooseberries for each fruiting year from 1896 to 1906, inclusive, under the various methods of treatment. Yard manure applied at the rate of 20 tons per acre each fall has proved to be the best fertilizer except with blackberries, where the increased yield was secured at too great a cost. A fertilizer analyzing 4.5 per cent nitrogen, 7.7 per cent available phosphoric acid, and 13.3 per cent potash, applied each spring at the rate of 500 lbs. per acre, gave the most profitable results with blackberries. Relative to the irrigation experiments it is stated that in no case has the irrigation given a sufficient increase in yield to make it profitable. However, it is believed that irrigation may be profitably employed on some soils in the State during periods of drought. In the variety tests the best yielders thus far are the Palmetto asparagus, Eldorado and Erie blackberries, Red Dutch and Victoria currants, and Downing and Houghton gooseberries.

Data collected during 1906, relative to the time when different trees make their twig growth, show that with the apple and the plum nearly half was made by May 18, with comparatively little growth after June 12. The growth of the pear twigs was nearly completed by June 26, and the cherry by July 10. It is suggested from this data that tillage should begin early and cease early to conform with the growth period.

Eleven commercial varieties of tomatoes were forced in the greenhouse during the season of 1905-6. The results are tabulated and further discussed. The Frogmore Selected, although the fruit averaged a little small, made the best showing in the trial on account of its large yield and good shape. Magnus-Dwarf Champion, one of the station's crosses, made an excellent showing. The fruit is said to be a very attractive pink-red. Hand-pollination as compared with self-pollination gave 48 per cent more fruit and a slightly smaller proportion of ill-shaped fruit. A marketing test was also conducted in the use of different size baskets and different size fruits. No difference in price per pound was received for the different size baskets. The medium size fruit, averaging about 3.3 oz. each, gave slightly the best results. A variety yielding fruit running 5 to the pound is considered best for forcing purposes. The range of prices received for the tomatoes at different periods from January 10 to April 9 is tabulated. The average for all fruits shipped, except culls, was 30 cts. per pound. The center bench contained 310 sq. ft. and yielded 641.5 lbs. of tomatoes, of which 540 lbs. were marketable. The gross returns from this bench space is estimated at $177 or 57 cts. per square foot. Several varieties of beans were also forced in conjunction with the tomatoes, and a table is given showing the yields. The most satisfactory varieties were the Curries Rust-Proof Wax, Improved Yellow Eye, Wardwell Kidney, Detroit Wax, and Golden Jersey. A list is given of radishes which proved satisfactory for forcing purposes.

An experiment was conducted in the forcing of asparagus, rhubarb, and strawberries with ether. The method of procedure is described and the yields are tabulated. The trial with the asparagus and strawberries was unsuccessful. With the rhubarb an increased yield was obtained principally at the first cutting.

A comparative test was made of a large number of wood preservatives as used on greenhouse benches. These included tar, creosote, carbolineum, whitewash, cement, copper sulphate, copper sulphate followed by cement, and copper sulphate followed by whitewash. The benches were treated in the fall of 1905 and the dirt was removed in the summer of 1906. The untreated benches were found to have decayed from one-fourth to one-half of the way through the wood. The beds treated with cement, lime, tar, and creosote were showing considerable decay. The results with copper sulphate alone were somewhat better, but the beds treated with copper sulphate followed by either whitewash or cement and the one treated with carbolineum showed no decay, with the exception of a single board in one of the copper sulphate beds. The relative value of the two latter methods will be determined later.

Tables are given showing the scheme of fertilizers for the entire orchard and the yields of the various fruits for 1906.

Report of the botanist, B. D. HALSTED and E. J. OWEN (*New Jersey Stas. Rpt. 1906, pp. 369–510, pls. 25*).—Plant breeding and selection among truck crops was continued at the station during the year. Further studies were made of a large number of crosses of sweet corn, popcorn, tomatoes, eggplants, summer and winter squashes, beans, and salsify, which have previously been reported (E. S. R., 18, p. 38), together with many more recent crosses. Other vegetables studied during the year included martynias, okra, onions, peas, peppers, udo, the prairie huckleberry, and several strains of Chinese cabbage. The various features of the work are discussed in detail, including descriptions of the experiments and the crosses tested, and general notes on the progress made with the different vegetables. Some attempts were made in the breeding of ornamental plants. A list, with notes, is given of the plants included in this work.

Some of the offspring among the hybrids of the bush bean and "scarlet runner" bean show a decided productiveness with the dwarf nature, and it is believed that they may develop into a strain of beans of much value. Some of the more important novelties secured among sweet corn, tomatoes, eggplants, and squash, together with the test of Chinese vegetables, are also described in a recent publication of the station (E. S. R., 18, p. 836), where a list is given of the seeds for free distribution.

Cuttings were taken from several varieties of tomatoes grown in the greenhouse and placed in the garden. A list of the cuttings made, together with the results secured, is given. This experiment is said to strengthen the belief that great uniformity in the fruit may be secured by propagation from cuttings.

The value of spraying with standard Bordeaux for the purpose of checking the pod spot and rust upon late growing beans was tested. Although the foliage held up on some of the sprayed plants longer than those which were untreated, no practical benefit was secured from the use of the Bordeaux mixture owing to the general absence of the diseases that were to be treated. Where rust appeared in limited amount, the late green podded sorts seemed to be more susceptible.

Pollination of forced tomatoes, S. W. FLETCHER and O. I. GREGG (*Michigan Sta. Spec. Bul. 39, pp. 10, figs. 7*).—Investigations were conducted during the winter seasons of 1906 and 1907, in order to determine the extent to which the irregularity and small size of some greenhouse tomatoes are influenced by imperfect pollination, as well as to ascertain the relative merits of cross-pollinated varieties and self-pollination. The experiments are described and the results secured are given in detail.

Lorillard, Frogmore, and Best-of-All were the varieties tested in 1906, and Ignotum, Sterling Castle, and Earliana in 1907. Blossoms on 4 plants of each variety were self-pollinated and blossoms of 8 plants of each variety were cross-pollinated with two other varieties. In both cases the fruits set equally well, although the cross-pollinated fruit averaged somewhat heavier. Tests were made of varying amounts of pollen, and the flowers from one plant of each variety was emasculated and pollinated on one side of the stigma only. This resulted in lopsided and small fruits. When from 1 to 5 pollen grains only were applied to the stigma, small solid fruits were produced having few or no seeds.

The general conclusions reached from this investigation are in substance as follows: It is not of primary importance to cross-pollinate any of the 6 varieties tested, although there may be a slight advantage gained in some cases. A one-sided tomato always results where pollen falls upon one side of the stigma only. The larger the stigma the greater the irregularity. Within certain limits the amount of pollen applied to the stigma determines to a great extent the size and smoothness of the tomato. Small, irregular tomatoes grown under glass are caused largely by insufficient pollination. Of the varieties tested the authors prefer Lorillard and Frogmore for forcing purposes.

The text concludes with brief suggestions to tomato growers on the subject of pollination.

Japanese mushroom growing, H. B. Miller (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2954, pp. 1-3*).—A brief account of the culture and commercial importance of Japanese mushrooms.

The most favored varieties, shii-take, and matsu-take are described. The demand for use at home and for export is so great that artificial propagation is resorted to, the shii-noki and other oaks being felled for the purpose. The trees selected are about 6 in. in diameter and cut into lengths of about 6 ft. The logs are scarred with a sharp knife and allowed to lie on the ground for a period of about 3 years, after which they are stacked in rows in a shady place and in a short time become covered with the desired fungi. The first crop is gathered in March and about August the logs are prepared for a second crop by soaking them in water for a day, beating them well with a mallet, and stacking in rows as before. Mushrooms again appear in a few days' time and continue growing for a considerable period.

In a series of experiments conducted by M. Ringakushi under the supervision of the forestry association, it has been found that trees cut in the autumn can be made serviceable for mushroom propagation after the following summer. The method by which this process is accomplished is not explained.

The exports of dried mushrooms from Japan in 1906 are given as 2,850,429 lbs., valued at $651,448. In 1900 the exports were only 376,625 lbs., valued at $90,667.

Fruits and early vegetables in southern Tunis, M. de Mazières (*Bul. Dir. Agr., Com. et Colon.* [*Tunis*], *11 (1907), No. 42, pp. 99-111*).—An account of the present condition of fruit and vegetable culture in southern Tunis, including statements as to the soil, climatic conditions, and general characteristics of the country, and the varieties grown, together with suggestions for the development of these industries for the purpose of supplying France and other European markets with early fruits and vegetables.

Field investigations in pomology, G. H. Powell (*U. S. Dept. Agr., Bur. Plant Indus.* [*Circ.*], *June 7, 1907, pp. 4*).—This circular contains a summary of the important features of investigations on the decay of California oranges in 1907, including investigations of packing-house methods, shipping fruit under ventilation, icing, and precooling, together with the cold storage of oranges and the keeping quality of the fruit on arrival in market. Considerable tabular data are given with regard to the various experiments under way and the general results are summarized as follows:

Summary of decay in all methods of shipment, February to June.

Approximate delay in shipping or in cooling—	1 day.	3 days.	5 days.	Average.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Brushed, apparently sound fruit	0.7	3.7	6.1	3.5
Washed, apparently sound fruit	1.4	3.3	6.2	3.6
Commercially packed fruit	3.0	6.0	9.8	6.3
Mechanically injured fruit	7.2	18.0	23.0	16.1
Average	3.1	7.7	11.3	

Fruits for Georgia, H. N. STARNES and J. F. MONROE (*Georgia Sta. Circ. 64, pp. 8, map 1*).—The Georgia State Horticultural Society has divided that State into four distinct regions according to soil and climatic conditions prevailing therein, as follows: The mountain region, middle region, southern region, and coast region. In this circular a map is given outlining the various regions, together with a variety list of fruits and nuts which have proved to be generally adapted for each, including apples, pears, peaches, plums, cherries, figs, quinces, Japan persimmons, pecans, chestnuts, pomegranates, grapes, strawberries, raspberries, blackberries, dewberries, currants, gooseberries, and Juneberries.

Commercial fruit growing, J. TROOP and C. G. WOODBURY (*Indiana Sta. Circ. 9, pp. 11, figs. 6*).—A popular circular discussing some of the possibilities of financial success in commercial horticulture in Indiana, and also dealing with such problems as varieties, methods of planting, and control of pests. Directions are given for the use of Bordeaux mixture and the lime-sulphur wash, together with lists of market varieties of apples recommended for planting in northern, central, and southern Indiana.

Annual report of the wine-making station of Haro for 1906, V. C. M. DE ZÚÑIGA (*Estación Enológica de Haro. Memoria Correspondiente al Año 1906. Haro, 1907, pp. 113, charts 3*).—The work of the wine-making station for the year, including laboratory and field investigations, is described.

Considerable tabulated data are given with regard to the comparative study of wines made from direct-bearers, grafted American stocks, and native varieties, planting operations, variety tests, the study of various insecticides, comparative data on different methods of cultivation, chemical analyses and meteorological observations. The viticultural courses offered by the station are outlined and a full report is also given of a lecture delivered by the author on the subject of American vines, in which lists are given showing the adaptability of American vines and American and European-American hybrids to various kinds of soils, together with instructions for the renewal of the Spanish vineyards with American vines.

The Heeleaka Experimental Station. Investigations during the seasons of 1905 and 1906, H. H. MANN and C. M. HUTCHINSON (*Indian Tea Assoc. [Pamphlet] 2, 1907, pp. 35, pls. 4*).—The object and plans of this station, including an outline of the manuring, pruning, plucking, and cultivation experiments, have been previously noted (E. S. R., 17, p. 867).

This pamphlet contains a detailed account of the fertilizer experiments and results secured during the seasons of 1905 and 1906, in which tests were made of cattle manure, oil cake, various combinations of chemical fertilizers, and green manures with respect to their effect on the yield of leaf and quality of tea, and on the bush itself as a permanent leaf-producing plant, as well as tests of the increased cost of production together with the increase in yield at different periods of harvesting, and of the effect of rain and temperature on the yield. In most cases the data given, covering different months of the plucking season from June to November of each year inclusive, are tabulated and further illustrated by graphical diagrams.

With regard to the relation of yield and weather, it appears from the data obtained that either an excessively high temperature or an excessive rainfall causes a drop in the yield of leaf, although at the end of the season the fall in temperature is accompanied, as might be expected, by a corresponding decline in the leaf growth.

The experimental plats consisted of old or more or less deteriorated stands of tea and the soil was of a very light and sandy nature, containing over 90 per cent of silicates. The chief purpose of the experiments was to determine the best means of restoring the vigor of these plantations. With the cattle manure applications were made of 20 tons per acre (applied triennially) and of 6⅔ tons per acre applied annually. Of the oil cakes 2 forms were used, mustard cake and castor meal, both being broadcasted in applications of either 1,230 lbs. per acre triennially, or one-third of this amount per acre applied annually. As compared with the cattle manure the use of oil cake was found to be more economical although cattle manure is necessary on soils poor in organic matter. The best results were secured by the use of about 410 lbs. of mustard cake applied annually, this giving an increased yield of 300 lbs. of tea per acre at an increased cost for production of 3 cts. per pound. With the stable manure the effect of the dressing was more marked the second year. The larger dressing produced the greatest effect, while with the oil cake dressings the effect was immediate and proved to be almost as great when the smaller quantity was used as with the larger amount. The quality of the leaf was not affected by the use of either cattle manure or oil cake. The improvement of the bush was noticeable in both instances but appeared to be [illegible]er with the oil cake.

On account of the increasing price of oil cake attempts were made to determine whether satisfactory results could be secured by the use of purely artificial manures, and several well-known ingredients were tested. These experiments resulted in a continuous increase in yield throughout the two seasons, but it is believed that the use of either superphosphate and sulphate of potash or of basic slag and sulphate of potash alone without manures containing nitrogen will prove too costly. In no case has the quality of the leaf suffered from the application of artificial manures except possibly slightly at the end of the season with nitrate of soda or sulphate of ammonia used alone. Sulphate of ammonia gave the best results at an increased cost of about 12¾ cts. per pound of tea. From the experiments as a whole it appears that oil cake is the cheapest fertilizer for manuring purposes, the next cheapest form at present being sulphate of ammonia. The experiments with commercial fertilizers have not been conducted sufficiently long to determine the most economical proportions of each to use and they may eventually prove to be cheaper than oil cake when used in the right proportion.

The results in green manuring for 1905 have already been noted (E. S. R., 18, p. 337). Of the plants suggested to be grown as annual crops among the tea, the following have been tested and reported on: Mati-kalai (*Phaseolus mungo*), dhaincha (*Sesbania cannabina*), groundnuts, *Crotolaria striata*, and arahar dhal (*Cajanus indicus*). Of these crops mati-kalai and dhaincha are said to be without rival under Assam conditions as green manuring plants among tea and are recommended for general use. The latter plant is said to have some advantages over the former since it is neither a creeper nor a favorite food of cattle and goats, and grows in poorer land.

Experiments in heavy pruning in Assam, H. H. Mann (*Indian Tea Assoc.* [*Pamphlet*] *3, 1907, pp. 20, pls. 3*).—In the seasons of 1900–1901 and 1901–2 a series of experiments were instituted by the author both to determine the best means of dealing with old and more or less deteriorated tea and to ascertain the comparative value of methods of pruning. The experiments were conducted by cooperators in 4 different gardens and the report is here given of the results secured for a period of 5 years. The value of light pruning, medium pruning, heavy and collar pruning, and replanting were compared in each case. The experiments are described in detail and the results are tabulated.

As a result of these experiments the following general conclusions are reached: Heavy pruning appears to be an injury to the bush, since although the immediate effect may be stimulating, the bushes are more difficult to treat, more liable to injury, and more apt to deteriorate than before heavy pruning was carried out. This method of pruning is not advised unless to correct initial bad pruning or where the lower stems are seriously injured. In this case it is recommended that the weaker plants of this kind be removed absolutely and replaced with new 2-year-old plants.

It is believed that much of the apparent benefit of low or collar pruning can be obtained by judicious cleaning out of the weak abortive shoots in the bush and concentrating its strength in a smaller number of shoots for the time being. A careful cleaning out of the bad and weak wood seems to give every benefit of medium pruning without the same temporary loss in yield, and at the same time leaves a better bush at the end of 5 years.

When the cleaning out of weak wood is not adequate for the rejuvenation of the bushes, the main framework of the bush should be thinned out rather than resort to middle pruning. Where land is manured well it often appears possible to render heavy pruning unnecessary, and on poor land heavy pruning is an ultimate failure.

Variations produced among roses, L. Daniel (*Compt. Rend. Acad. Sci.* [*Paris*], *144* (*1907*), *No. 25, pp. 1451–1453; Rev. Hort.* [*Paris*], *79* (*1907*), *No. 15, pp. 356, 357*).—The author claims to have produced some systematic variations in the nature and color of rose petals by means of grafting. The bush of the Rainbow, a variety which produces variegated flowers, is said to have produced a shoot bearing nonvariegated roses which every year present some new changes in form and color difficult to fix. Changes of form and color in the petals of other varieties are also described.

FORESTRY.

The waning hardwood supply and the Appalachian forests, W. L. Hall (*U. S. Dept. Agr., Forest Serv. Circ. 116, pp. 16, fig. 1*).—In this circular considerable data are given showing the decline in hardwood stands in the United States, including the condition as shown by the various kinds of timber, by States, and in the main regions of production. The effects of a hardwood shortage on several important industries, including the manufacture of hardwood lumber, cooperage stock, furniture, musical instruments, vehicles, agricultural implements, car building, railroad ties, telephone and other poles, and house finishing are discussed, and a diagram is given showing the advance in prices of some of the principal hardwoods during the past 8 years, as well as the range of prices since 1887.

Although the hardwood industries center in the States of Illinois, Indiana, Ohio, Michigan, and New York, it is shown that the situation concerns the entire country, and in the author's opinion the only practical solution "is to maintain permanently under a proper system of forestry a sufficient area of hardwood land to produce by growth a large proportion of the hardwood timber which the nation requires." It is further suggested that if the Appalachian forests are rightly managed and taken soon enough the hardwood supply of the country can be insured continuously, and through systematic treatment the forest can be improved at the same time.

The life history of the beech, G. T. Boulger (*Quart. Jour. Forestry, 1 (1907), No. 3, pp. 230–279, figs. 32*).—In this paper the author traces the various phases in the life history of the beech from the seed and its germination to the ripening and shedding of the fruit. Special attention is paid to the structural and physiological characters of the seed, root, stem, bud, leaf, and flower, together with notes on the fungus and insect enemies of the beech.

An appendix is devoted to the description, life history, and control of the felted beech coccus, considered one of the most destructive pests, including its distribution, signs of infestation, and treatment.

Second progress report on the strength of structural timber, W. K. Hatt (*U. S. Dept. Agr., Forest Serv. Circ. 115, pp. 39*).—This circular is intended to supplement the results previously published by the Bureau of Forestry (E. S. R., 16, p. 783) on tests of the mechanical properties of our more important commercial woods, including the loblolly pine, longleaf pine, tamarack, and Norway pine of the eastern United States, and the Douglas fir and western hemlock of the Pacific coast. Tests were made on large beams with a view of studying the relations between strength, defects, and the degree of seasoning, and for determining moduli for design, together with additional tests on small pieces cut from the uninjured parts of the tested beams, including bending, compression parallel to grain and at right angles to grain, and shearing, as well as tests to study the effects of moisture, rate of growth, and other factors. The work has been conducted at the various testing laboratories of the Forest Service during a period of 4 years, and the methods are given in a previous circular (E. S. R., 18, p. 486).

Tabulated data secured from the various tests are here given and discussed, together with the text of the revised rules of inspection and grading.

Use of dead timber in the National forests, E. R. Hodson (*U. S. Dept. Agr., Forest Serv. Circ. 113, pp. 4*).—This is a report of a study of the amount, location, and quality of fire-killed timber, as well as the extent to which it is used, which has been made by the Forest Service in several of the National forests in the southern Rocky Mountain region. Three classes of dead timber were found—fire-killed timber, timber killed by insects, and timber killed by such other causes as drying out or lightning.

In this circular special attention is paid to fire-killed timber. The area studied approximated 13,000,000 acres, on which there is an estimated amount of 500,000,000 ft. B. M. of merchantable dead timber, or about 4 per cent of the total merchantable stumpage. Of this it is estimated that 50 per cent is fit for saw lumber and all of it can be utilized in the round. The principal defect of fire-killed timber is check.

Relative to the strength of the fire-killed timber, a table is given showing the strength of white fir killed by fire 12 years ago and that of green timber of the same species and from the same locality. The crushing strength of the green timber was 2,595 lbs. per square inch, while that of the dead timber was 4,824 lbs. per square inch. Where the green timber is seasoned, tests made indicate that dead white fir is about nine-tenths as strong as green white fir, and about twice as strong as green timber freshly cut. The dead timber thus far has been used chiefly for mine timbers, coal props, telephone poles, railroad ties, and fence posts. It is estimated that the mines of Leadville, Colo., use each month 350,000 ft. B. M. of dead timber. Better grades are also used for dimension stock, although it is unfit for inch stuff owing to the frequent cross checks.

The general conclusion is reached that sound dead timber, particularly when fire-killed, has decided value and keeps this value for a considerable length of time. It does not decay readily, is not impaired by standing in a dead condition, and is perfectly seasoned, easily handled, and cheap to ship. Owing to the absence of watery sap it is in good condition for preservative treatment. Its use is recommended wherever checking is not a detriment, both as a prevention of waste and the saving of more valuable timber for better uses.

The preservative treatment of fence posts, H. F. WEISS (*U. S. Dept. Agr., Forest Serv. Circ. 117, pp. 15, fig. 1*).—This circular contains an account of experiments conducted by the Forest Service with a view of determining an economical commercial method of impregnating fence posts with creosote. The experiments are described, the results are tabulated and briefly discussed, and some conclusions are deduced which are of general application in fence post treatment.

Initial experiments were conducted in cooperation with the Bureau of Plant Industry during the Louisiana Purchase Exposition at St. Louis in 1904, in which posts cut from maple, elm, sycamore, ash, cottonwood, sassafras, hickory, black walnut, water oak, willow, and red oak were treated. Further experiments were conducted at Elwood and Los Angeles, Cal., with blue, red, and sugar gums, and ironbark. With the results secured from these first experiments as a guide, more complete experiments were made at St. Anthony, Idaho, in 1906, in treating fence posts cut from fire-killed lodgepole pine. The open tank treatment was used in all of the tests. In all 18 kinds of wood were treated and a table is given showing the resulting penetration in each case.

The experiments at St. Anthony were divided into three series, in which it was sought to determine the minimum of efficient temperature for the hot creosote, the minimum efficient duration of the bath in hot creosote, and the minimum efficient duration of immersion in the creosote after shutting off the heat. These results are tabulated and show that the hotter the creosote the greater the absorption and penetration. Within fixed limits increased duration of the bath in hot creosote, other factors being equal, gives greater absorption and penetration. This is also said to hold true with regard to the duration of immersion in the cooling creosote. The effect of a long period in hot creosote with a short period in cool creosote has not thus far been determined.

Tabulated data are given showing the comparative cost of untreated and treated posts of lodgepole pine in Idaho. The estimated annual cost of an untreated post is given as 5 cts., and of a treated post as 3 cts. Thus it is figured that at the end of 20 years a creosoted fence will be about 40 cts. per post cheaper than if untreated. Based upon these results some general directions are given relative to the selection, preparation, and treatment of fence posts.

Introductory statements deal with the growing need for the preservative treatment of fence posts, causes of decay, and preservative methods now in use.

New wood preservative, J. A. VAN HEE (*Daily Consular and Trades Rpts. [U. S.], 1907, No. 2921, p. 10*).—The author reports that recent experiments in Belgium on the preservation of wood, made with a new coal-tar extract known as "injectol," have given satisfactory results. In the experiments injectol was applied to wooden poles, railway ties, and blocks used in street paving.

As compared with creosoted poles in the ground, which resisted decay for only a few months' time, those treated with injectol remained unattacked after 3 years. Similar experiments were also made with railway ties, these being treated with coal creosote, creosote and chlorid of zinc, and with injectol, and left for a period of 2 years in a steeping vat composed of liquid manure and other miscellaneous decomposing substances. At the end of this period the sleepers treated with injectol were still in good condition, while the others were almost completely destroyed. Similar results were obtained with paving blocks. Further experiments are now being carried on.

Injectol is said to be a very thin dark-brown liquid of regular density with a degree of viscosity changing very little with atmospheric variations. One of its principal advantages is said to be its penetration into certain woods without any pressure. The time necessary for the pressure and the soaking into wood of a given quantity of injectol is reported as considerably less than for any other antiseptic liquid, including creosote.

Camphor industry, J. H. ARNOLD (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2920, pp. 8-10*).—A brief review of the progress and extent of camphor production in China, together with statistics of production in Japan.

The camphor-producing districts in China are said to be confined at present to the region along the Min River in Fukien Province, although the occurrence of trees in other provinces is also noted. The development of the camphor industry in China has made remarkable progress during the past few years, largely, it is believed, because of Japanese initiative and the advancement in the price of camphor. Upward of 1,100,000 kin (1,467,000 lbs.) were exported in 1906. At the present rate of production it is believed that the trees will be capable of yielding material for but 4 or 5 years longer.

Tables are given showing the production of camphor and camphor oil in Japan from 1904 to 1906, inclusive, as well as the value of camphor imported into Japan during the past 6 years in the form of celluloid. The estimated production of camphor for 1906 is approximately 5,546,325 lbs., and of camphor oil 4,616,812 lbs. The value of camphor imported in the form of celluloid in the same year is given as $407,424. The productive power of Japan and Formosa combined is estimated as 85,212,375 lbs. of camphor and 75,061,250 lbs. of camphor oil. The monopoly bureau is encouraging the cultivation of the trees with the view of maintaining the present productive power.

Caoutchouc in French West Africa, Y. HENRY (*Le Caoutchouc dans l'Afrique Occidentale Francaise. Paris: Gouvt. Gén. Afrique Occident. Franc., 1906, pp. 239, pls. 16, figs. 9, map 1, dgms. 8*).—This work treats of the various phases of the rubber industry in French West Africa, including the history of its exploitation in the different colonies prior to 1904, the total production and commerce of French West African types of rubber in the various European markets, and an explanation and discussion of the laws adopted on February 1, 1905, for the purpose of regulating and improving the methods of exploitation and preparation of rubber, together with an account of the results obtained after the law had been in force for one year.

The work is based on the author's personal observations and investigations, together with information secured from official documents. The text is accompanied by a map of the country and numerous illustrations and statistical tables.

A journey through guayule land, H. C. PEARSON (*India Rubber World, 35 (1907), No. 6, pp. 173-177; 36 (1907), No. 1, pp. 205-210, figs. 26, map 1*).—This is an account of the discovery and development of the guayule rubber industry in northern Mexico, including a description of the country and the methods of exploitation and production of rubber, with descriptions and illustrations of the factories now in operation.

Damaged rubber trees renewing themselves, F. M. RYDER (*Mo. Consular and Trade Rpts.* [*U. S.*], *1907, No. 322, p. 163*).—In this note the author states that the trees in the Bluefields district of Nicaragua, which were believed to have suffered considerably from the hurricane last fall, are renewing themselves very satisfactorily. Where the trees have been blown down, but not uprooted, they are sprouting freely and the roots from the sprouts appear to be forcing their way through the trunk of the parent tree into the ground beneath, hence it is believed that the increase in the number of trees in the plantations will be considerable.

Cooperative forestry work for 1908, W. J. GREEN and L. H. GODDARD (*Ohio Sta. Circ. 74, pp. 3*).—In this circular a general outline is given of the cooperative forestry work which the station proposes to undertake in 1908, together with a blank form to be used by any farmer of the State who desires to cooperate with the station.

DISEASES OF PLANTS.

Report of assistant plant pathologist, H. S. FAWCETT (*Florida Sta. Rpt. 1907, pp. XLIII–LII, pls. 3, figs. 3*).—The principal investigations reported are studies on the scaly bark, gumming and scab of citrus fruits, the fungi parasitic on the white fly, peach diseases, pecan mildew, etc.

The scaly bark disease of citrus trees seems to be a new disease, and while specimens of diseased lemons and fruit of sweet oranges were received at the station 3 years before, it was not until in 1906 that a study of the disease was undertaken. So far as present information goes this disease seems to be confined almost entirely to the sweet orange. The trees when badly infested present the general appearance of having been neglected and poorly fertilized. The leaves are usually small and yellow, and the trunks and larger limbs bear large scaly areas. The bark and older limbs show ruptured scales. On the smaller branches and younger woods the areas become definitely defined. At first the diseased area is of a lemon color, changing later to a rusty brown. In these areas the epidermis becomes brittle and cracks open, forming scales or flakes, as is the case on the older limbs. The cause of this disease has not yet been definitely determined.

Citrus scab and gumming are described and suggestions given for their control.

Among the parasites of the white fly, descriptions are given of two species of Aschersonia, *A. flavo-citrina* and *A. aleyrodes*. Cultures are being prepared of both these fungi with the idea of using them in spraying white-fly infested trees. A third species of Aschersonia (*A. turbinata*) has been found to be parasitic on the wax scale.

An account is given of pecan mildew, in which it is stated that the crop was practically destroyed by the fungus *Microsphæra alni*. Spraying experiments showed the possibility of controlling this disease, but it would probably be impracticable on large trees. Since the fungus is carried over on the dead leaves and fallen nuts, the author recommends the collection and burning of all trash and the cultivation of the orchard in the winter season, if practicable.

A brief description is given of a disease of roselle, due to *Microsphæra* sp., in which the Oidium stage of the mildew occurs abundantly on the leaves, petioles, and stems, giving the plant the appearance of having been dusted with lime or flour.

Report of the horticulturist [on plant diseases], G. W. WARREN and JENNIE A. VOORHEES (*New Jersey Stas. Rpt. 1906, pp. 224–236*).—This report contains an account of the bacterial blight of pear trees, "cloudiness" of pears, brown rot of plums, spraying experiments for the control of San José scale, the spraying of apples, pears, eggplants, tomatoes, and cantaloupes, the spraying of tomatoes and strawberries in bloom, methods of making Bordeaux mixture, and a description of stock solutions of copper sulphate.

The bacterial blight was unusually serious during the period covered by the report. On many varieties the larger part of the blossoms were killed, in some cases the entire crop being lost. Later considerable twig blight followed.

The cloudiness of pears, which is characterized by rustiness of the fruit, was investigated, and found to be due to three causes—frost, the use of too strong fungicides, and fungus diseases. In many cases the disease is believed to be due to the after effect of fungus diseases, among the principal of which are attacks of the apple scab fungus.

In the spraying experiments described, the application of lime-sulphur-salt was found very efficient for the control of the San José scale, and Bordeaux mixture for the control of brown rot of plums. The application of Bordeaux mixture to apples and pears caused some rusting of the fruit and spotting of the leaves. This is attributed to the use of too strong a fungicide. Eggplants sprayed with Bordeaux mixture to which arsenate of lead was added produced more early fruit and apparently a considerably greater crop.

Experiments in spraying tomatoes are described in which there was apparently little difference between the sprayed and unsprayed plants until the middle of August, after which time the sprayed plants were decidedly of a more vigorous character. The tabulated results show an increase of about 24 per cent of marketable fruit as a result of the spraying.

In order to test the effect of spraying experiments on strawberries and tomatoes while in bloom, two trials were made, and while the results are somewhat contradictory, it does not appear that the spraying had any serious effect on the setting of the fruit.

A method of making Bordeaux mixture is described which is believed to have some advantages over those generally given. This consists essentially in having the tank containing either the copper sulphate or the lime nearly full of water before adding the other. Where the copper sulphate alone was diluted the column in the cylinder containing the fungicide remained unseparated for a much longer time than where both solutions were concentrated. Where both solutions were diluted the fungicide remained in suspension for about the same length of time as when the copper sulphate alone was diluted.

Notes are given on the preparation of stock solutions of copper sulphate, the expansion of water when copper sulphate is dissolved, and the amount of copper sulphate in a saturated solution.

Some important plant diseases of Washington, W. H. Lawrence (*Washington Sta, Bul. 83, pp. 56, figs. 18*).—A number of the more important plant diseases which have been observed in Washington are described and suggestions given for their prevention, as far as means are known. Among the diseases are the club root of cabbage, crown gall of various plants, fire blight of pears, late blight of potatoes, peach leaf curl, apple and pear scab, blackspot canker of apples, potato scab, canker of soft maple, brown rot of stone fruits, dry rot of potatoes, wheat smut, root rot of prunes, etc.

Among these diseases are a number that are not commonly met with in this country. Of these the principal diseases are the blackspot canker of apple trees due to *Myxosporium curvisporum*, the canker of soft maple caused by *Tubercularia vulgaris*, and the root rot of prune trees due to *Armellaria mellea.*

The blackspot canker is said to be next in importance to the apple scab in western Washington. The fungus lives in the bark of the tree for about a year and then dies. The low temperature and abundant moisture in October and November favor the germination of the fungus, which enters through the bark. The infected spots increase slowly as the fungus penetrates into the sap wood. When the trees begin to unfold their leaves in the spring the cankers increase rapidly in diameter and are mature by June or a little later. The cankered bark becomes dry and brittle and separates from the living tissues, leaving prominent scars. Spraying with double strength Bordeaux mixture in November is recommended for the control of this disease.

The canker of soft maple is said to have made its appearance quite recently and is causing considerable damage. It affects the host plant early in the spring, causing numerous leaf and flower buds to be killed before the time of opening. Later in the season twigs and larger branches are girdled and the wood is more or less discolored, showing that the fungus penetrates into it to a greater or less degree. When the girdling of the limbs takes place the leaves begin to roll up, due to a lack of sufficient moisture. For combating this disease it is recommended that the dead and dying leaves be cut out and burned, and that one or two thorough sprayings with Bordeaux mixture in the spring be given the trees.

The root rot of prune trees, which seems to be of considerable importance, is more fully described in a previous publication of the station (E. S. R., 15, p. 689).

Two interesting apple fungi, F. L. STEVENS (*Science, n. ser., 26 (1907), No. 673, pp. 724, 725*).—The author gives brief accounts of two species of fungi recently found attacking apples.

The first, *Hypochnus ochraleuca*, which has not hitherto been reported from any region other than Brazil, was found to be very destructive to apples and quinces in the mountain regions of North Carolina in 1906. Later, specimens were received from the coastal plain in the eastern part of the State, and in the fall of 1907 the fruiting forms were obtained, enabling the author to identify the fungus.

The second species described seems to be identical with *Phyllosticta solitaria*, which is believed to be the cause of a disease of the fruits as well as the canker of the limbs of apple trees, and also to cause the familiar leaf spot of apples. This fungus seems to be widespread and the cankers formed are quite destructive.

Bitter rot of apples, botanical investigations, T. J. BURRILL (*Illinois Sta. Bul. 118, pp. 554–608, pls. 10*).—The results of extended investigations on the cause of bitter rot of apples, the methods of infection, and the effect of fungicides on the spores are given.

The bitter rot of apples is said to be due to the fungus *Glomerella rufomaculans*, which in Illinois is practically confined to apples and apple tree limbs. On the limbs the fungus produces spots called cankers, and it is the mycelium in these cankers and in old infected fruits that survives the winter. The apple limbs seem to become infected only in spots where the bark has been previously injured, and they may originate in wounds made as late as the time of the apple harvest. The spores of the fungus are readily destroyed by copper sulphate, but it appears impossible to kill the fungus in the limb cankers except by cutting out the cankers and treating the excised areas. Ordinarily the disease makes its appearance in July or August but may start as early as June 1.

The disease seems to be distributed to some extent by pomace flies, but the principal infection is by means of spores washed from the cankers which infect the fruits hanging below on the tree. The spores and spore masses are found to be readily distributed by the wind, sometimes to a considerable distance. The first infection of the tree comes from spores produced in the limb cankers or in mummy apples of the previous year that have been allowed to hang on the trees during the winter.

It is claimed that the disease may be entirely eradicated from the orchard by careful attention to the destruction of the cankers and mummy fruits, supplemented by effective spraying with Bordeaux mixture.

Bitter rot of apples, horticultural investigations, J. C. BLAIR (*Illinois Sta. Bul. 117, pp. 482–551, pls. 2*).—An account is given of spraying experiments for the control of bitter rot of apples, the experiments having been inaugurated in 1901 and continued for 5 years. In this work 12 orchards were used and 17 series of experiments were conducted.

The experiments in the different years together with the results are described, and in conclusion the author states that Bordeaux mixture properly made and applied will save more than 90 per cent of the fruit liable to attack by bitter rot. Bordeaux mixture applied in the liquid form is the most effective spraying material for the control of bitter rot, dust Bordeaux being less efficient. Pure copper sulphate solutions failed to check the disease and caused considerable injury to the foliage. Fruit sprayed in such a manner as to be thoroughly coated with the spray mixture when the first infection of the disease appeared was less injured by bitter rot than when sprayed at a later period.

Attention is called to the sources of infection and recommendations are given for the control of bitter rot.

California peach blight, R. E. SMITH ET AL. (*California Sta. Bul. 191, pp. 73–100, figs. 17*).—The California peach blight, which is due to *Coryneum beyerinkii*, is described at considerable length and suggestions given for its control.

This disease has recently appeared in the principal peach producing districts of the State. Nearly all varieties are more or less affected, the young growth in some places being completely killed.

Experiments were carried on for the control of this disease, and it was found that trees sprayed in December or early in January, followed by applications in February or early in March, were not only less affected by peach blight but also by the leaf curl. In connection with the spraying the trees should be pruned if possible, but in no case should the work be delayed on account of inability to prune. For the first application a rather strong Bordeaux mixture is recommended, while for the second a somewhat more dilute solution or a lime, salt, and sulphur spray may be employed.

The grape powdery mildew and the injury it causes, M. JERIA (*Rev. Vitivin. Argentina, 4 (1907), Nos. 13, pp. 202–204; 14, pp. 218, 219; 15, pp. 232, 233; 16, pp. 254, 255; 19, pp. 296–299; 20, pp. 312–314*).—This describes the powdery mildew of the grape, due to *Oidium tuckeri*, gives an account of the losses due to this parasite, and suggests remedies for its control. For this purpose the use of dry sulphur at the rate of about 100 kg. per hectare in 3 applications is recommended.

Diseases of coffee trees, G. DELACROIX (*Agr. Prat. Pays Chauds, 7 (1907), Nos. 54, pp. 235–253, pls. 3; 55, pp. 321–333, pl. 1*).—This paper describes the leaf spot diseases of coffee caused by the fungi *Stilbum flavidum*, *Sphærella coffeicola*, *Cercospora coffeicola*, *Glœosporium coffeanum*, etc., the destruction of the floral branches by *Anthostomella coffeæ*, *Hendersonia coffeæ*, and *Rhabdospora coffeæ*, and a disease of the roots due to an undetermined fungus, the fruiting form of which is as yet unknown.

The fir disease in the Jura forests, E. HENRY (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 18, pp. 725–727*).—According to the author, in the summer of 1906 a disease became abundant in the fir forests in the Jura region which was characterized by the reddish color of the foliage, the color seeming to increase toward the end of the summer. In the spring of 1907 the disease had apparently disappeared, but during the summer it reappeared and attacked the branches of a great number of trees. In October, 1907, it was reported that about 50 per cent of the fir trees growing in pure forests on the lower plateaux were attacked, and that on the upper elevation scarcely a tree had escaped, but so far as observation has been made none of the trees have been destroyed.

An investigation into the cause of this trouble led to the recognition of the fungus, which has been called *Phoma abietina*, or more properly *Fusicoccum abietinum*.

The effect of the fungus on the foliage and branches of the trees is described at considerable length. The author states that while it undoubtedly causes a reduction in the annual growth of the trees proportional to the percentage of leaves attacked, yet it apparently does not cause the death of the trees. It is believed that the severity of attack will diminish, as has been the case in a number of other outbreaks of the fungus that are recorded.

The brown rot of the lemon, R. E. SMITH ET AL. (*California Sta. Bul. 190, pp. 72, pl. 1, figs. 30*).—A detailed account is given of the brown rot of the lemon due to *Pythiacystis citrophthora*, a preliminary description of which has already been noted (E. S. R., 18, pp. 344). This fungus attacks and destroys large quantities of lemons not only on the tree but also in the packing house. The fungus is described in detail and accounts given of experiments for its control. These included not only an investigation of the trees in the orchard and the soil underneath them, but also the methods of handling the fruit while preparing it for shipment.

For the control of this disease the author recommends a cover crop in the orchard in September or early October. Toward the end of the rainy season this cover crop should be plowed under, and the orchard kept in clean cultivation, especially under the trees, during the summer. This will to a large extent prevent the infection of the fruit. As a further precaution, the author recommends the disinfection of the wash water by adding either formalin, permanganate of potash, or copper sulphate, the last named being preferred as cheaper and more efficient. Lemons infected in the orchard should be carefully eliminated during picking and washing, and where any are found in the curing tents the affected boxes should be carefully gone over and rotten lemons picked out, as the disease spreads by contact.

A short review of parasitic fungi of Ficus elastica, S. H. KOORDERS (*Notizbl. K. Bot. Gartens u. Mus. Berlin, 4 (1907), No. 40, pp. 297–310*).—An annotated list is given of 65 species of fungi that are known to occur as active parasites, facultative parasites, or saprophytes on the rubber plant (*Ficus elastica*).

The chrysanthemum ray blight, F. L. STEVENS (*Bot. Gaz., 44 (1907), No. 4, pp. 241–258, figs. 15*).—A description is given of a ray blight of cultivated chrysanthemums which was called to the author's attention late in 1906. The disease had been known for several years, recurring each year with increased destructiveness.

The symptoms of the disease are most conspicuous in the flower clusters, which are usually attacked on one side either in the bud or during the various stages of blooming. The affected blossoms change in color, cease to develop, and wither, the discoloration proceeding from the base toward the tip of each individual flower. If the disease be severe and the bud attacked while young, no ray flowers will develop and the head will not open. If the disease appear later one-half or two-thirds of the flowers may develop normally, thus rendering more conspicuous the disease. The receptacle of the flower turns black and the peduncles may be blackened for 1 or 2 cm. below the head. On affected plants the stems are often blackened for several centimeters, in a band more or less completely encircling the stem.

A microscopical examination was made of the diseased flowers. A fungus was isolated and passed through various cultures, and its characteristics are given.

The fungus proved to be a new species and has been named *Ascochyta chrysanthemi* n. sp. Repeated inoculations that have been made seem to indicate that the fungus is the cause of the diseased condition, and that it can gain entrance to the tissues of the blossoms more easily than to the tissues of the leaves, petioles, and stems.

A new chrysanthemum disease, E. S. Salmon (*Gard. Chron., 3. ser., 42* (*1907*), *No. 1082, p. 213, figs. 2*).—A description is given of the leaf spot of chrysanthemums which is caused by *Septoria chrysanthemi.* The leaves which are affected exhibit brown patches, become crumpled at the margins, and fall prematurely. On the basis of investigations that have been carried on at a number of places in this country, the author recommends spraying with Bordeaux mixture or one of the clear fungicides.

According to Magnus (see below), the proper name of this fungus is *S. chrysanthemella.*

Concerning the Septoria on chrysanthemums and the occurrence of the disease in Central Europe, P. Magnus (*Ber. Deut. Bot. Gesell., 25* (*1907*), *No. 6, pp. 299–301*).—A study of material has convinced the author that the fungus hitherto described as *S. chrysanthemi* should be known as *S. chrysanthemella.* The disease seems to be well recognized and to occur in a number of places in central Europe. This is the third troublesome fungus disease of chrysanthemums, the others being mildew (*Oidium chrysanthemi*) and rust (*Puccinia chrysanthemi*).

A study of diseases of Pelargonium, J. Chifflot (*Jour. Soc. Nat. Hort. France, 4. ser., 8* (*1907*), *June, pp. 348–355*).—A summary is given of the various parasitic and other diseases which affect the cultivated Pelargonium, the author grouping them under the headings of plant parasites, animal parasites, and organic diseases.

Among the parasites due to plants attention is called to the attack of *Orobanche hederæ* on the roots of the Pelargonium, this being the only phanerogamic parasite mentioned. Among the fungi, brief accounts are given of the attacks of *Botrytis cinerea* and *B. doryphora, Fusarium pelargonii, Rhabdospora cæspitulosa,* and *Bacillus caulivorus,* all of which attack the stems and roots of plants, *Glœosporium pelargonii, Macrosporium pelargonii, M. macalpinianum,* which is especially destructive to the varieties of *Pelargonium zonale, Cercospora brunkii, Fumago vagans, Diplococcium conjunctum, Botrytis cinerea,* and *B. doryphora* occurring on the leaves. *Æcidium pelargonii* and *Puccinia granularis* are also found to attack certain varieties of Pelargonium.

The principal insects are *Siphonophora pelargonii,* scale insects, and red spiders. A number of forms of disease which are attributed to improper soil and other conditions are briefly described.

The action of salts of copper in the treatment of plant diseases, R. Lafon (*Jour. Soc. Nat. Hort. France, 4. ser., 8* (*1907*), *June, pp. 356–368*).—A discussion is given of the action of copper when used as a fungicide, with directions for the preparation of a number of fungicides in which copper is the main principle.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

An economic study of field mice, D. E. Lantz (*U. S. Dept. Agr., Biol. Survey Bul. 31, pp. 64, pls. 8, figs. 3*).—A classification of the field mice which occur in this country is given, together with notes on their distribution and habits. Three typical species to which attention is given are *Microtus pennsylvanicus, M. ochrogaster,* and *M. pinetorum scalopsoides.*

A detailed account is given of the damage done by mice to meadows, pastures, cereals, forage crops, garden crops, small fruits, nursery stock, orchards, forest trees, and lawns. Various reports relating to this damage have been received from farmers.

The natural agencies which assist in the control of field mice are climatic changes, epidemic diseases, and mammals, birds, and snakes. The chief artificial means of restraint consist of trapping, and other mechanical devices, improved cultural methods, poisoning, fumigation, and dissemination of infectious diseases. The author urges the protection of the natural enemies of field mice, clean cultivation of crops, a rotation system which prevents land from remaining too long in grass, and the destruction of trash and litter about orchards and gardens.

Means of controlling mice, H. RAEBIGER (*Landw. Wchnschr. Sachsen, 9 (1907), Nos. 40, pp. 358-360; 41, pp. 366-368*).—Experiments were carried on to determine the most effective and economic methods for destroying various species of mice including *Arvicola amphibius*, *A. agrestis*, *A. glareolus*, *Mus musculus*, etc. The conclusion is reached that the best means for controlling mice is to be found in the use of specific bacterial cultures. For the destruction of field mice, the author recommends the use of cultures of mouse typhoid and for the eradication of other species of mice cultures of ratin.

Some notes on the food of birds, C. H. HOOPER (*Jour. Bd. Agr. [London], 14 (1907), No. 7, pp. 402-412*).—Circular letters of inquiry were sent to various correspondents asking for observations on the feeding habits of a number of common birds. The replies received have been so summarized as to show the average diet of blackbirds, sparrows, thrush, finches, pigeons, etc. A study of the feeding habits of the black-headed gull showed that earthworms are almost a constant ration for these birds. Considerable numbers of wireworms, slugs, and other insects were also found in the stomachs of the black-headed gulls, but fish appeared to have been eaten rather sparingly.

Index-catalogue of medical and veterinary zoology, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 39, pt. 19, pp. 1399-1492*).—In this part of the index-catalogue of medical and veterinary zoology a list of authors is given from Mitschein to Myrepsus.

Report of the entomologist, E. W. BERGER (*Florida Sta. Rpt. 1907, pp. XXX-XLII, pls. 2*).—The chief entomological problem of the year was white fly. At present 3 parasitic fungi, the red and yellow Aschersonia and the brown fungus are known to be important agents in its control. A fourth species (*Sphærostilbe coccophila*) is sometimes found upon young white flies but is of little value except for scale insects.

The most important result from this investigation was the demonstration that the red and yellow fungi may be successfully used in controlling white flies by spraying a mixture of the spores of these fungi in water on the under surface of the leaves. This method has been compared with that of pinning infested leaves and has proved better than the latter. In spraying mixtures of the spores of the parasitic fungi it is important that the spraying apparatus should not have been previously used for Bordeaux mixture or other fungicides since spores might thus be destroyed. The results from this work in the destruction of white flies have been very striking. Some benefit has also been reported from the use of these fungi in controlling the white fly in greenhouses.

Sphærostilbe coccophila is widely distributed throughout the State and in other localities. This fungus in connection with *Ophionectra coccicola* and *Myrangium duryi* has been found a very effective means of destroying San José and other scales. Notes are also given on orange chionaspis, white peach scale, West Indian scale, mealy bugs, plant lice, palmetto weevil, leaf hoppers, and other insect pests.

Report of the entomologist, J. B. SMITH (*New Jersey Stas. Rpt. 1906, pp. 515–609, pls. 15, figs. 18*).—The San José scale still remains the most important scale insect in the State. Some damage was also observed during the year by the attacks of oyster-shell bark-louse, scurfy scale, peach soft scale, cottony maple scale, etc.

Observations were made on plum curculio, apple-tree borer, pear-leaf blister-mite, pear psylla, army worm, wireworms, white grubs, asparagus beetles, wheat maggots, various forestry insects, rose chafer, grape galls, plant lice, and miscellaneous insects. The army worm occurred in a quite serious outbreak during the year, and the natural enemies and remedies for this insect are considered. The gipsy moth was introduced into the State for purposes of study and fears were entertained that it had escaped but apparently this was not the case. A large variety of remedies was tested in attempting to control root maggots of onions and various cruciferous plants, and the remedies were tried in a cooperative manner by growers. Apparently neither tobacco nor hellebore served as an effective repellent for these pests. Some benefit, however, was observed from the use of carbolic acid, kerosene emulsion, and certain proprietary remedies.

It is stated that brood XIV of the periodical cicada failed to appear in New Jersey, it having probably been destroyed by English sparrows and other enemies. Accounts are also given of tussock moth, elm-leaf beetle, and remedies used in the control of San José scale, and other insects. Both lime and sulphur wash and soluble petroleums are effective in destroying San José scale. Crude petroleum is still used in the State to some extent in the control of scale insects. Detailed descriptions are given of arsenate of lead, Paris green, lime-sulphur wash, a number of proprietary insecticides, crude oil, kerosene limoid, carbolic acid, whale-oil soap, and other insecticides.

Entomological notes (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 7, pp. 765–770*).—There appears to be a slight diminution in the number and extent of the swarms of locusts in Natal. The cultures of locust fungus used in Natal appear to have lost their virulence and are of little or no value.

Mention is made of a rot of cotton bolls apparently due to the attack of insects.

[Entomological notes] (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 8, pp. 925–928*).—Brief notes are given on the location of locust swarms, the use of locust fungus, the stinging of horses by bees, and locusts in Argentina.

Color varieties of Locustidæ, F. KNAB (*Science, n. ser., 26 (1907), No. 670, pp. 595–597*).—Attention is called to the striking variations which have occasionally been observed in species of the Locustidæ. At times rose colored or scarlet specimens are observed and this color variation appears to be connected with the color of the food. It is suggested that this matter needs further study.

The larch shoot moth. Grain weevils, R. S. MACDOUGALL (*Jour. Bd. Agr. [London], 14 (1907), No. 7, pp. 395–399; 412–415, figs. 3*).—A description is given of *Argyresthia lævigatella* in all its stages. The moths issue from the twigs in May and June, and in the spring of the second year the attacked shoot fails to develop its buds. The best treatment for this pest consists in breaking off and destroying infested shoots.

Brief economic and biological notes are given on *Calandra granaria* and *C. oryzæ*.

A revision of the American components of the tenebrionid subfamily Tentyriinæ, T. L. CASEY (*Proc. Wash. Acad. Sci., 9 (1907), pp. 275–522*).—The American species of this subfamily are arranged in a systematic manner together with analytical tables to assist in their identification. A number of new genera and species are described.

Cleonus punctiventris and means of combating it, V. Pospyelov (*Vyestnik Sakh. Promuishl., 1906, No. 6-8; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 1, pp. 102-105*).—The beetle hibernates in the soil to a depth of 14 in. or less. According to the author's observations beetles which appear in the fall do not deposit eggs the same year. A number of natural enemies of Cleonus are known but the chief reliance must be placed on artificial remedies such as hand collecting, spraying with Paris green and barium chlorid, and trapping beetles in ditches.

Note on the cotton failure on account of bollworm in the Central and Southwest Punjab in 1905, and on the results of the measures taken to prevent a recurrence in 1906, W. Renouf (*Dept. Agr. Punjab Bul. 1, 1907, pp. 13*).—The most injurious bollworm in Punjab is *Earias insulana*. A systematic attempt is being made to control this pest. The remedial measures which have given favorable results are destruction of old cotton stalks, plowing the cotton fields, the use of *Hibiscus esculentus* as a trap crop, and the introduction of parasites.

The potato plant louse, Edith M. Patch (*Maine Sta. Bul. 147, pp. 235-257, figs. 9*).—During the summers 1904-1906, *Nectarophora solanifolii* caused great injury to potatoes, especially in Aroostook County, Maine. Badly infested stems were killed for a distance of 4 to 6 in. at the tips. In some seasons predaceous and parasitic insects and fungi hold the potato plant lice in check. If this should not occur it is possible that an application of kerosene emulsion or a similar insecticide would destroy them. The effect of this treatment upon potatoes, however, is not known, and it was thought desirable, therefore, to study the life history of the insect with the view of learning some other means of control.

It was found that the plant lice appear in July, become most numerous toward the last of August, and begin to migrate toward the middle of September. The alternate host is the shepherd's purse and possibly other related plants are utilized for this purpose. It is recommended, therefore, that such weeds be destroyed in potato fields by fall plowing or other means and that the precaution be taken of removing all belated potato tops which may serve as food for the plant lice. Notes are given on the natural enemies of the potato plant louse and the insect is described in its various stages.

The codling moth, R. S. Woglum (*N. C. Dept. Agr. Ent. Circ. 20, pp. 16, figs. 7*).—In North Carolina as in many other States the codling moth is the most destructive insect pest of the apple. There are 2 broods annually, the second being the more injurious. The first brood may be controlled by spraying immediately after the blossoms fall with arsenate of lead or Paris green in water or in Bordeaux mixture. The best results have been obtained from the use of arsenate of lead in Bordeaux mixture. The numbers of the second brood may be considerably reduced by the use of bands which should be examined every 10 days and by supplemental spraying with the insecticides recommended for the first brood.

Petroleum emulsion for the San José scale, C. D. Jarvis (*Connecticut Storrs Sta. Bul. 49, pp. 12*).—Excellent results have been obtained from the use of lime-sulphur wash in controlling San José scale, but it was thought desirable to carry on experiments with soluble oils since these insecticides offer fewer difficulties in their application. The proprietary soluble oils cost, when diluted, about 3 cts. a gallon and are, therefore, considered too expensive. An attempt was made to prepare a soluble oil at a more reasonable cost.

For this purpose an emulsifier is made containing carbolic acid, fish oil, caustic potash, kerosene, and water, the first three being heated to a temperature of 300° F., after which the kerosene and water are immediately added.

In order to prepare the complete soluble oil the necessary ingredients were mixed in the following order: Emulsifier 8 parts, crude petroleum 18 parts, rosin oil 4 parts, and water 1 part. This stock preparation may be made for from 16 to 18 cts. per gallon, and when diluted with 15 parts of water makes a spraying material at a cost of slightly more than 1 ct. per gallon. This material has been tested on commercial orchards with satisfactory results.

Fruit fly (*Jour Dept. Agr. So. Aust., 10 (1907), No. 12, pp. 869–870*).—A copy is given of the regulations enforced by South Australia against the importation of trees, plants, and fruits from countries infested with the fruit fly. These regulations are believed to be justified.

Fumigation for the white fly, G. F. Warren (*New Jersey Stas. Rpt. 1906, pp. 242–247, pls. 2*).—The occurrence of a serious infestation of greenhouses by the white fly led to fumigation experiments for the purpose of destroying this insect. It was found that an all-night fumigation using ⅝ oz. of potassium cyanid per 1,000 cu. ft. of space killed the insects but injured tomato plants. Even ½ oz. per 1,000 cu. ft. of space caused some injury. The different varieties of tomatoes were found to vary somewhat in resisting power to the bad effects of fumigation. Injury caused by fumigation began to appear about 4 o'clock on the day following the operation. In all experiments the formula used called for 1 oz. of potassium cyanid and 2 fluid ounces of sulphuric acid per 4 oz. of water.

The author found it possible to stay in the greenhouse during fumigation in which 1 oz. of potassium cyanid was used per 1,000 cu. ft. of space. The only effect noticed was a headache and symptoms of a cold. It is suggested, however, that these results should not lead to the abandonment of ordinary precautions in fumigation with hydrocyanic-acid gas, for the gas exercises serious if not fatal effects upon many individuals. The all-night fumigation at the rate of ⅝ oz. of potassium cyanid per 1,000 cu. ft. of space seriously injured tomatoes, as already indicated, but did not harm beans, lettuce, or cucumbers. Better results are obtained by fumigation in the daytime for a period of 15 to 20 minutes. It appears impossible to kill the flies by fumigation at night without injury to some of the plants.

New experience with the olive fly, A. Berlese (*Coltivatore, 53 (1907), No. 42, pp. 487–490*).—After a continued test of the mixture containing sugar and an arsenical salt the author believes that this remedy has been definitely proved to give better results than any other which has been tried.

The effect of cold on borers in coffee trees, L. Boutan (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 9, pp. 464–466*).—Coffee trees are sometimes seriously injured by *Xylotrechus quadrupes*. The author tested the effect of cold upon the larvæ of this insect in portions of the wood of coffee trees, in the living trees, and outside of their burrows. It was found that a sufficiently low temperature could be produced by volatilizing ethyl chlorid upon the branches of coffee trees to destroy the larvæ of the borer without injuring the trees. It is not claimed, however, that this method will prove to be practicable.

Effect of low temperatures on almond pests, De Loverdo (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 7, pp. 587–589*).—Almonds in storage are sometimes greatly injured by the attacks of *Paralipsa gularis* and *Plodia interpunctella*. The author tested the effect of cold upon these insects. Eggs kept for 6 months at temperature ranging from — 3 to +4° C. failed to hatch. Similar temperatures prevented the growth of young caterpillars of both species.

Insects injurious to timber, L. Grandeau (*Jour. Agr. Prat., n. ser., 14 (1907), No. 38, pp. 361–363*).—Attention is called to the ravages of white ants and boring wasps, particularly of the genus Sirex, in timbers and household furniture.

The generations of bark beetles, BORGMANN (*Ztschr. Forst u. Jagdw., 39 (1907), No. 8, pp. 513-518*).—This is a controversial article regarding the length of the life cycle of bark beetles, particularly *Tomicus typographus*. Attention is called to the difficulties of determining the average length of a generation of this insect.

Tomicus polygraphus in Lorraine, HENRY (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 7, pp. 622-635*).—The habits and life history of this pest are outlined. The best method of combating the insect consists in cutting down and destroying infested trees in winter.

Combating Ennomos lituraria, SCHMIDT (*Ztschr. Forst u. Jagdw., 39 (1907), No. 8, pp. 534-536*).—It has been suggested that some good might be accomplished in fighting this insect by the removal of fallen leaves and other rubbish about the base of trees. A thorough test of this method over a considerable area of coniferous forest showed little or no benefit from the removal of the rubbish.

The structure, development, and bionomics of the house fly, C. G. HEWITT *Quart. Jour. Micros. Sci. [London], n. ser., 51 (1907), No. 203, pp. 395-448, pls. 5*).—A detailed description is given of the internal and external anatomy of the house fly. The literature relating thereto is discussed in connection with a bibliography.

Report of the mosquito investigations in 1906, J. B. SMITH, W. P. SEAL, and J. A. GROSSBECK (*New Jersey Stas. Rpt. 1906, pp. 611-670, pls. 7, fig. 1*).—The work of mosquito eradication was continued during the year under the State law which provides funds for this purpose. An account is given of the status of the work about Jersey City, Newark, Elizabeth, Atlantic Highlands, in the Linden marshes, along Shrewsbury River, and at other points, together with notes on the species observed and their relative prevalence. It has been found that a combination of carbolic acid and gum camphor makes a volatile substance of great efficiency in destroying mosquitoes in houses. Mention is also made of other practical remedies and of some proprietary mixtures.

An experiment in the introduction of fish belonging to the species *Gambusia affinis* and *Heterandria formosa* as destroyers of Anopheles larvæ was without practical results, as the fish failed to live in streams where they were introduced. It is suggested, however, that this might be accomplished by the State fish commission.

Information concerning the North American fever tick, with notes on other species, W. D. HUNTER and W. A. HOOKER (*U. S. Dept. Agr., Bur. Ent. Bul. 72, pp. 87, pls. 4, figs. 13*).—Attention is called to the great economic importance of the cattle tick in this country. Details are presented regarding losses caused by cattle ticks, the life history of this pest, its relations to cattle and other animals, the natural enemies of ticks, and the practical methods for the destruction of ticks. The most effective methods for eradicating ticks are those which break the biological relation between cattle and ticks. Such methods are found in feed lot or soiling systems and the pasture rotation system.

An elaborate series of observations indicates that the length of the period from the dropping of ticks to oviposition ranges from 3 to 41 days. It is also found that the minimum incubation period varies at different seasons of the year from 21 to 56 days and the minimum period from the dropping of the ticks to the hatching of the eggs from 24 to 75 days. During these experiments it was determined that the maximum period from the dropping of the adult ticks to the death of the seed ticks ranges from 61 to 293 days. These data may be used in a practical way in devising systems of feed lot and pasture rotations.

It is believed that although the occurrence of the cattle tick on horses, mules, deer, and other animals is rare, this fact must be taken into consideration in the practical work of eradicating ticks. The adult tick crawls only a few feet at most from the point where it falls upon the ground. There are no important natural enemies of ticks. Experiments indicate that seed ticks survive submergence in water for a period of 157 days and adults sometimes recover from the same treatment after 48 hours. It is apparent, therefore, that water courses are important means of disseminating ticks.

The latter portion of the bulletin is occupied by the classification of the ticks found in this country including the genera Argas, Ornithodoros, Margaropus, Rhipicephalus, Dermacentor, Hæmaphysalis, Ixodes, and Amblyomma. Biological notes are given on the important species of these genera. A bibliography relating to ticks is appended to the bulletin.

The presence of mites in the long bones of the wings of birds, E. L. TROUESSART (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 15, pp. 598–601*).—*Cytodites nudus* has been occasionally found in the air sacs of domestic fowls and rarely in the marrow cavities of the long bones. In a collection of birds which the author received and which were preserved in formaldehyde, an examination of the wing bones disclosed the presence in the marrow cavity of large numbers of the mite which is described as new under the name *Tyroglyphus antricola*. This mite lives in decaying vegetation and is believed to have reached the marrow cavities of the bones of the wing through the respiratory passages and air sacs. The mite was evidently capable of living and reproducing itself in the long bones.

Uses of insects as food, delicacies, medicines, or in manufactures, H. VON P. BERENSBERG (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 7, pp. 757–762, pl. 1*).—The literature relating to the utilization of insects was examined by the author for the purpose of making a list of insects used as food, medicine, or in manufactures. Among the insects which have been most extensively used as food mention is made of locusts, crickets, cicadas, white ants, and the larvæ of various beetles and other insects.

Plant maladies and their control, H. N. STARNES and J. F. MONROE (*Georgia Sta. Circ. 62, pp. 18, figs. 4*).—A spraying calendar is given with brief notes on some of the more important insects and fungus diseases and the standard insecticides and fungicides.

FOODS—HUMAN NUTRITION.

A precise method of roasting beef, ELIZABETH C. SPRAGUE and H. S. GRINDLEY (*Univ. Ill., Univ. Studies, 2 (1907), No. 4, pp. 37, pls. 4, dgms. 10*).—The effects of different temperatures and other conditions on the quality and character of roast beef were studied, special attention being paid to oven temperatures and the temperatures of the interior of the meat, the latter values being obtained by means of thermometers inserted deeply in the roasts. It was found that the character of the cooked meat was determined by the interior temperature during cooking. If this temperature ranges from 55 to 65° C. the meat will be underdone or rare and red in color. At a temperature of 65 to 70° it will be medium underdone and at a temperature of 70 to 80° it will be well done.

The temperature conditions of the interior of a roast may be accurately and readily determined by means of thermometers and therefore the authors conclude that the degree of cooking and the character of the product may be regulated by this means, whereas even after long experience little reliable information can be gained from the appearance of the outside of the roast regarding the degree to which the interior is cooked. Except in the case of meat cooked until well done at 100° C. a rise in temperature in the center of the meat after removal from the oven was always noted under the experimental conditions provided the meat was not cut. "This rise in temperature depends upon (1) the temperature of cooking, (2) the temperature of the interior of the roast when removed from the oven, and (3) the size and shape of the roast.

"Although in the process of roasting the meat is submitted to a temperature far in excess of that suitable for the cooking of proteid, it is evident that only a very thin outside layer of the meat is affected by this temperature. The temperature of the interior rises very slowly and follows the same rule as does the rise in temperature after removing from the oven. That is, the greater the difference between the temperature of the outside and the inside of the meat, the greater is the rise of temperature.

"The number of minutes per pound necessary to produce a certain degree of cooking depends upon (1) the character of the cut as regards size, shape, etc., and (2) the temperature of the oven. For example, a single short rib roast containing the bone required 16.3 minutes per pound to cook the meat rare, while the two-rib rolled roasts averaged 20.1 minutes at the same temperature to reach the same condition.

"The roasts are as quickly cooked at 175° C. as at 195° C. This is important from a practical standpoint as it involves a question of economy in fuel, especially if gas is the fuel used.

"When cooked at 100° C., a very much longer time is required to raise the inner temperature from medium (62° C.) to well done (72°) than to cause the same rise at 195° C. or 175° C. There is, therefore, very much less danger of overcooking the meat at this temperature (100° C.). At the higher temperature a very few minutes overcooking may be sufficient to carry the inner temperature above the desired degree.

"The lower the temperature of cooking, the more uniform is the condition of the interior of the meat."

The effect of bleaching upon the quality of wheat flour, F. J. ALWAY (*Nebraska Sta. Bul. 102, pp. 56*).—Extensive analytical and other studies of the effects of bleaching upon flour are reported. A portion of the investigation has been noted from another publication (E. S. R., 19, p. 509).

Over 100 samples of freshly manufactured flours from mills in different parts of the State were examined, some of the samples being bleached and others unbleached. Of the bleached flours part of the samples came from mills using electrical processes and part from those using chemical bleachers. In general, the author concludes that the bleaching, as practiced by Nebraska millers, neither improves nor injures the quality of the flour.

From a comparison of the colors of bleached and unbleached flours, it appeared that the whitest unbleached flours gave the whitest flours after bleaching although they contained the smallest amounts of nitrites of the samples examined. "Both the whitening of the flour and the amount of nitrites formed varies as the amount of nitrogen peroxid used, provided that the latter is not excessive and the manner of application is the same . . . The lower grades of flour did not have their gray tints weakened and many of the bakers' grade appeared more undesirable in the bleached than in the unbleached condition, the yellow tint of the latter partly obscuring the gray color." No general relation was found to exist between the colors of the mill bleached flours and the quantities of nitrites present.

When the amount of nitrogen peroxid used in bleaching did not exceed 50 cc. per kilogram of flour no appreciable change in acidity was noted in a comparison of the acid content of bleached and unbleached flours. Larger amounts of the peroxid caused an increase in acidity.

Bread was made from a number of the bleached and unbleached flours. Some of the conclusions which were drawn follow:

"Neither the absorption of a flour nor the expansion of its gluten is affected by bleaching.

"Bread made from bleached flours does not differ in weight, lightness, texture, odor, or taste from that made from unbleached flours; it is, however, in all cases whiter, where high grade flours are used. Low grade flours when bleached produce bread with an uninviting color.

"There is no difference in the effect upon the bread-making qualities whether a chemical or an electrical bleacher is used.

"Bleached flours sometimes yield bread containing nitrites and at other times bread free of nitrites. In all cases the amount of nitrite in the bread is much smaller than that in the flour."

While the author considers the use of a small quantity of nitrogen peroxid as a bleaching agent to be harmless, he points out that "the quantity of peroxid may be so increased as to seriously injure the quality of the flour, but as such a quantity unfavorably affects the color of the flour there is no danger of such overtreated flour being intentionally produced by any miller."

Banana flour, W. SCHELLMANN (*Pflanzer, 2 (1906), pp. 353–356; abs. in Chem. Zentbl., 1907, II, No. 8, p. 623*).—Analyses of African and Indian banana flour are reported.

The water content of lard, E. POLENSKE (*Arb. K. Gsndhtsamt., 25 (1907), pp. 505–511; abs. in Chem. Zentbl., 1907, II, No. 2, pp. 172, 173*).—From his investigations the author concludes that lard can be manufactured in quantity without difficulty with a water content not over 0.2 per cent.

The spoiling of canned vegetables and its cause, C. VON WAHL (*Centbl. Bakt. [etc.], 2. Abt., 16 (1906), p. 489; abs. in Hyg. Rundschau, 17 (1907), No. 17, pp. 1068–1070*).—The author has isolated and identified a number of micro-organisms which cause canned vegetables to spoil.

The penetration of bacteria through the shell into the interior of eggs, R. LANGE (*Arch. Hyg., 62 (1907), No. 3, pp. 201–215*).—The experiments quoted showed that when hens' eggs were immersed in bouillon cultures, typhoid and other pathogenic bacteria could penetrate the unbroken egg as far as the yolk.

Data are given regarding the time and temperature necessary to cook eggs in order to kill bacteria and spores. Eight minutes cooking at 100° C. was sufficient to kill typhoid and some other bacteria in the egg yolk, but cooking 30 minutes at 80° or one hour at 70° was insufficient for the purpose. The author states that when an egg was cooked one hour at 60° both the white and yolk remained fluid though the yolk was milky. When cooked for an hour at 70° the white was slightly coagulated though still fluid while the yolk was solid.

Can dysentery bacilli pass through the shell of fresh eggs? SACHS-MÜKE (*Arch. Hyg., 62 (1907), No. 3, pp. 229–238*).—According to the author's experiments, bacteria causing dysentery do not pass through the shell of unbroken eggs. Introduced artificially into the egg they remained alive for at least 17 days. Cooking eggs until hard boiled destroyed such bacteria.

Allyl sulphid: Some aspects of its physiological action with an analysis of the common leek (Allium porrum), E. W. CARLIER and C. L. EVANS (*Bio-Chem. Jour., 2 (1907), No. 7–8, pp. 325–339, figs. 6*).—In connection with this study of the physiological action of allyl sulphid, the characteristic flavoring body present in onions and related plants, a detailed analysis of the onion is reported. Some of the conclusions follow:

"The first effect of a moderate dose [of allyl sulphid] is an excitation of the central nervous system, followed by the usual compensation, viz., depression. . . .

"Allyl sulphid taken in the form of garlic, onions, or leeks, immediately before retiring at night may produce either an excited or depressed state of the nervous system, or both in succession, according to the dose."

General results of the investigations showing the effect of sulphurous acid and sulphites upon digestion and health (*U. S. Dept. Agr., Bur. Chem. Circ. 37, pp. 18*).—The extended series of experiments summarized were made with 12 young men who volunteered as subjects. They were 40 days under observation, the experimental period of 20 days being preceded and supplemented by periods of 10 days each. The preservative was administered as sodium sulphite in capsules or as an aqueous solution of the gaseous sulphurous acid.

From a consideration of the individual data and summaries of results it appears that sulphurous acid, thus administered, "is objectionable and produces serious disturbances of the metabolic functions and injury to digestion and health. This injury manifests itself in a number of different ways, both in the production of clinical symptoms which indicate serious disturbances, malaise, or positive suffering, and also by inducing certain changes in the metabolic processes which are not manifested in the way of ordinary clinical symptoms, and are only detected by careful chemical and microscopical study of the excretory products."

The sodium sulphite and sulphurous acid under the experimental conditions produced a marked influence of an unfavorable character upon metabolism. The assimilation of food materials containing organic phosphorus was retarded and there was evidence of increased sulphur katabolism. This involves an increase in the amount of work performed by the kidneys.

"The fact that the microscopic crystalline and amorphous bodies in the urine are increased in number under the influence of the added sulphur is another indication of the extraordinary demands made upon the kidneys in such circumstances. . . . While there might be no distinguishable lesion of the kidneys produced during a period of 20 or 30 days, or even longer, it is plain that, sooner or later, lesions of a very serious character, producing organic diseases, possibly of an incurable type, would be induced. The further observation that there is a marked tendency to the production of albuminuria, although of an incipient character, is an indication of the unfavorable results of the administration of the sulphurous acid. It is, therefore, evident that by increasing the burden upon the excretory organs, the administration of sulphur in the form mentioned is highly detrimental to health."

The sulphurous acid also exercised a bleaching effect on the color of the blood and produced a diminution of the number of red and white corpuscles, a matter which is considered of serious concern.

"The variations of the metabolic processes, from the normal, as indicated in this series of experiments, were never of a character favorable to a more healthy condition of the system, but, on the other hand, all these variations, in so far as the effect of the changes could be distinguished, are of a prejudicial character. There is no evidence whatever that the sulphur added to the foods in the form of sulphurous acid or sulphites takes any part in the nutrition of the tissues of the body containing sulphur, namely, the proteids; hence no claim of food value can be established for these bodies. The evidence all points to the fact that they are purely drugs, devoid of food value, having no favorable effect upon the metabolic processes, but, on the other hand, exerting deleterious and harmful effects. The conclusion, therefore, is inevitable that as a whole the changes produced in metabolic activity by the administration of sulphur in the forms noted above in the comparatively short time covered by the experiments are decidedly injurious. The verdict which must be pronounced in this case is decidedly unfavorable to the use of this preservative in any quantity or for any period of time, and shows the desirability of avoiding the addition of any form of sulphurous acid to products intended for human food."

Formic acid in preservatives and the toxicity of formic acid, F. CRONER and E. SELIGMANN (*Ztschr. Hyg. u. Infectionskrank., 56 (1907), No. 3, pp. 387–399; abs. in Ztschr. Fleisch u. Milchhyg., 17 (1907), No. 12, p. 433*).—Experiments with small animals showed that formic acid caused the formation of methyl globulin and that it was cumulative in its action.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 80–81, pp. 4; 82, pp. 2; 83, pp. 8*).—The subjects included are glazed coffee, labeling of caramels, labeling of coffee produced in the Dutch East Indies, and the issue of a guaranty based upon a former guaranty.

Food inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 145, pp. 187–202*).—Under the provisions of the State pure food law, 15 samples of maple sugar and 44 samples of maple sirup were examined. In the case of the sugar 7 samples were not found to be adulterated, 4 were branded maple compounds, and 4 were adulterated with other sugar. Eleven samples of the sirup were not adulterated, 3 were adulterated, 19 were marked compounds, and the remainder were below standard in solids.

[Food and dairy products] (*Mich. State Dairy and Food Dept. Bul. 138–142, pp. 1–26*).—Data are given regarding the foods examined, the number of prosecutions made, and other work carried on under the provisions of the State pure food law.

Text-book of food chemistry, H. RÖTTGER (*Lehrbuch der Nahrungsmittel-Chemie. Leipsic, 1907, 3. ed. rev., pp. XIV + 901, pl. 1, figs. 22*).—The author states that this edition has been revised and that considerable new material has been added. Under the latter heading may be mentioned the section on the identification of edible fungi.

Some observations on the diet of natives in the Tropics, G. REYNAUD (*Ann. Hyg. Pub. et Méd. Lég., 4. ser., 7 (1907), Apr., pp. 315–342*).—The author reports 15 dietary studies made in the Tropics with soldiers, prisoners, laborers, etc., and quotes in detail the results of 11 similar studies made by other investigators in the Kongo region, Dahomey, Senegal, Madagascar, and the Dutch East Indies. Some of the results which he reports follow:

Results of dietary studies.—Quantities eaten per man per day.

Persons studied.	Average body weight.	Protein.	Fat.	Carbohydrates.	Fuel value.	Fuel value per kilogram body weight.
New Caledonia:	*Kg.*	*Grams.*	*Grams.*	*Grams.*	*Calories.*	*Calories.*
Native workmen in town	.....	91.61	23.42	349.67	2,099.98	32.2
Natives working on plantations	.....	148.75	28.21	589.10	3,279.35	50.4
Japanese laborers, earlier studies	50	110.00	5.80	611.23	3,010.00	60.0
Japanese laborers, later studies	.....	164.35	18.04	832.45	4,351.18	87.0
Annamite laborers	.....	133.94	13.01	790.92	3,866.27	77.3
Tonkin: Soldiers (natives of Lao-Kay)	57	91.38	75.38	570.52	3,394.88	59.5
Cochin China: Native prisoners	50	109.00	22.50	632.00	3,405.77	68.1
Egypt:						
Native soldiers	60	112.46	28.11	540.36	2,825.52	47.0
Native prisoners	60	145.08	16.63	609.95	3,169.07	52.8

In discussing the question of diet in the Tropics, the author concedes that a normal maintenance ration will furnish 35 to 40 calories per kilogram body weight (about 2,400 and 2,700 calories for a man weighing 150 lbs.) and not more than 80 to 100 gm. of protein. If, however, muscular work is performed, he believes that the diet should equal that needed in other countries for the performance of a like amount of work, and cites instances which show that generous amounts of food are required in the Tropics for the performance of physical work and a corresponding maintenance of vigor and physical condition.

A school luncheon, A. L. BENEDICT (*Dietet. and Hyg. Gaz., 23 (1907), No. 7, p. 404*).—A school luncheon is described, costing one cent per person, which furnished 8.69 gm. protein, 9.08 gm. fat, and 35.11 gm. carbohydrates.

Prepared and predigested foods, G. LUSK (*Jour. Amer. Med. Assoc., 49 (1907), No. 3, pp. 201, 202, 270*).—A paper, with discussion, in which food requirements of the human body are considered and the composition and true value of a number of proprietary foods and food products are discussed.

Sham feeding experiments with adults, HELENE KAZNELSON (*Arch. Physiol. [Pflüger], 118 (1907), No. 5-7, pp. 327-352, figs. 6*).—Some of the conclusions which were drawn from experimental investigations with hospital patients follow: Widely different stimulants which affect the organs of taste or smell can induce gastric secretion in the passive stomach or increase a weak secretion if already started. The mechanical act of chewing did not bring about gastric secretion. A fat-cleaving ferment is found in the gastric juice. The acidity of the gastric juice in normal man is relatively constant but the quantity secreted shows the greatest variations.

On metabolism during starvation. I, Nitrogenous, E. P. CATHCART (*Jour. Physiol., 35 (1907), No. 5-6, pp. 500-510*).—Particulars are given regarding the excretion of different urine constituents during a 2 weeks' fast and preliminary and supplementary periods. The smallest nitrogen output per day, 2.84 gm., was noticed on the third day of a practically nitrogen-free diet, starch and cream, in the period immediately following the fasting period.

Experiments on prolonged protein feeding, D. FORSYTH (*Jour. Physiol., 35 (1907), No. 5-6, pp. XL, XLI*).—Domestic fowls were kept on a meat diet for periods varying from 11 months to 2 years and remained healthy. An abundant supply of lime was given with the meat. Post-mortem examinations showed no changes in the viscera, the thyroids were not enlarged, the long bones were healthy, and there was no indication of gout in the joints.

Investigations on the formation of glycogen in the liver, K. GRUBE (*Arch. Physiol. [Pflüger], 118 (1907), No. 1-2, pp. 1-29, figs. 3*).—According to the investigations reported, the liver can form glucose from the simple sugars, dextrose, lévulose, and galactose, but not from cane sugar, milk sugar, pentosans, carbohydrate-free protein, or active and inactive amino acids.

The influence upon metabolism of the air pressure noted in automobiling, A. MOUNEYRAT (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), pp. 1241, 1242; abs. in Chem. Zentbl., 78 (1907), II, No. 4, p. 345*).—The air movements noted in rapid automobiling, according to the author's investigations, increase the number of red blood corpuscles in normal and also in some pathological subjects. Urine analyses indicated that metabolism was decidedly increased.

ANIMAL PRODUCTION.

Notes on South African food stuffs, H. INGLE (*Transvaal Agr. Jour., 5 (1907), No. 20, pp. 925-928*).—In a discussion of horse and mule feeding under local conditions and of the importance of mineral matter in the ration, the author concludes that oat hay or oat hay and mealies (Indian corn) "are not suitable as the exclusive diet of working horses and mules, for two reasons: (1) Such a diet is not rich enough in nitrogenous matter in proportion to carbohydrates and fats to properly supply the requirements of the animals; (2) the diet is defective in its capability of supplying materials for proper nourishment of the bones of animals and thus is favorable to the production of bone diseases." (For earlier work see E. S. R., 19, p. 565).

The digestibility of Maizena feed, O. KELLNER and F. HONCAMP (*Landw. Vers. Stat., 66 (1907), No. 3, pp. 253-255*).—As shown by the average of experiments with 2 sheep Maizena feed had the following coefficients of digestibility: Organic matter 79.2 per cent, protein 83.6 per cent, fat 76.5 per cent, nitrogen-free extract 82.8 per cent, and crude fiber 36.6 per cent.

Miscellaneous analyses, J. P. STREET (*New Jersey Stas. Rpt., 1906, p. 37*).—Analyses are reported of a number of fodders, including oat and pea straw, oat and pea hay, crimson clover hay, alfalfa hay, cowpea hay, fowl meadow hay, corn silage, cowpea silage, soy bean silage, corn stover, barnyard millet, soy beans, winter wheat and hairy vetch, and Kafir corn and cowpeas.

Market prices of commercial feeds, J. P. STREET (*New Jersey Stas. Rpt., 1906, p. 38*).—A summary of data on the prices of commercial feeds for 5 years.

The application of Mendel's law of inheritance to breeding problems, R. H. BIFFEN (*Jour. Roy. Agr. Soc. England, 67 (1906), pp. 46-63, figs. 5, dgms. 3*).—A summary of data on progress which has been made in plant and animal breeding.

Report of the special investigation on horse breeding in Ontario, 1906 (*Ontario Dept. Agr., Spec. Rpt. 1906, pp. 136*).—Data are collected regarding such topics as the number and class of stallions in each county and the number of each breed in the Province.

Perfection in cattle and in animal breeding. Complexity of the problems involved, H. BOUCHER (*Jour. Méd. Vét. et Zootech., 57 (1906), Aug., pp. 458-469; Sept., pp. 539-547; Oct., pp. 590-597; Nov., 651-667; 58 (1907), Feb., pp. 82-91; Mar., pp. 137-148; Apr., pp. 208-212; May, pp. 269-281*).—An exhaustive discussion of the technique of animal breeding, state aid, insurance of farm animals, and other factors which are of importance in securing improved conditions.

Wintering yearling cattle, H. J. WATERS (*Missouri Sta. Bul. 75, pp. 53*).—Various coarse fodders with and without grain were compared for wintering cattle. The tests with coarse fodders extended over 4 years and included 14 lots of 4 to 6 steers each.

In the first test timothy hay and whole-corn stover were compared and an average gain of 29 pounds per head was noted on the hay and a loss of 2 lbs. on the stover.

Shredded corn stover and siloed corn stover were included as well as whole corn stover and timothy hay in the second test, which covered 92 days. On the siloed stover and the timothy hay there were gains of 10.8 and 32.2 lbs., respectively, and on the whole stover and the shredded stover there were losses of 11.8 and 15.6 lbs.

In a test covering 74 days, which was practically a duplicate of the above except that clover hay and shredded corn stover 1 : 1 were also studied, there was an average loss on shredded corn stover of 7.7 lbs. per head and gains on the other feeds ranging from 13.8 lbs. on whole corn stover to 77.2 lbs. on siloed corn stover. Good gains, namely, 58.4 lbs. per head, were also noted on the clover hay and corn stover.

In the fourth test whole-corn stover and clover hay 1 : 1 were again fed in comparison with timothy hay and whole stover. On the clover-hay ration there was an average daily gain per head of 0.09 lb. and on the hay and stover rations losses of 0.11 and 0.76 lb., respectively.

In general, timothy hay of average quality was found to be nutritious enough "to a little more than maintain the weight of yearling steers that were in thin condition to begin with. That is, steers of this class were wintered on timothy hay of fair quality without loss in weight, and, on the average, made a slight gain. [The change in weight was small] . . . varying from a slight loss in one experiment, when the weather was particularly unfavorable, to a fair gain when the quality of the hay was good and the weather was dry, bright, and crisp. . . .

"The average ration for the yearling steer weighing 750 lbs. was 33.6 lbs. of stover of which 19.83 was eaten, leaving 13.77 lbs., or 41 per cent as refuse or waste material. . . . Taking the average of our four years' work, it appears that whole field-cured corn stover, handled as in ordinary farm practice, would not quite maintain yearling steers moderately thin to begin with. That is, the average of all of our trials shows a loss of 33 lbs. per steer, on the basis of a 6 months' wintering period, or from November 1 to April 30.

"In these experiments we offered an average of 33.5 lbs. of stover daily per steer, computed on the basis of 750 lbs. live weight. This would require 3 tons of stover per steer for a 6 months' wintering period. The results with shredded stover were slightly less favorable than with whole stover, although the difference was so small as to be easily within the limit of error. . . .

"Our results show that almost as much of the material was refused by the animals when shredded as when fed whole, notwithstanding the fact that the animals were offered a considerably less quantity of the shredded than of the whole material. . . . Siloed stover without grain produced very much better results than did field-cured stover, either fed whole or shredded, but the results are too meager to warrant a definite conclusion. In every trial equal parts of clover hay and corn stover proved to be more efficient than did timothy. By combining stover with clover therefore it is possible to bring its feeding value up to that of timothy hay, or, on the assumption that stover has little feeding value, the conclusion is justified that clover has practically double the feeding value of timothy."

The tests in which small amounts of grain, 4 to 6 lbs. per head, were fed in comparison with different kinds of coarse fodder extended over 4 years, the individual tests being made with lots of 4 steers, weighing about 750 lbs. each and covering from 66 to 120 days. In every case the coarse fodder was fed ad libitum. In the first of the tests mixed grain (corn meal and cotton-seed meal about 3:2) and corn meal with whole corn stover were fed in comparison with the coarse fodders in the last of the tests mentioned above. On the mixed grain ration there was an average daily gain of 0.77 lb. per steer and on the corn meal ration a loss of 0.32 lb.

When shelled corn with timothy hay, with whole stover and clover hay 1:1, and with cowpea hay ad libitum were compared with cowpea hay alone the daily gains on the rations containing grain ranged from 0.65 lb. on shelled corn and timothy hay to 1.54 lbs. on shelled corn and cowpea hay. On the cowpea hay alone there was a gain of 0.56 lb. per head per day. At the close of the test, April 30, these lots were pastured until December 24. The gains made ranged from 345 lbs. per steer with the lot which received corn and cowpea hay to 422 lbs. with the lot which had been fed corn and timothy hay.

In the third test of similar grain rations with hay of different sorts shelled corn was fed with timothy, clover, millet, and sorghum hay and with corn stover and clover hay 1:1. Gains were noted in every case, ranging from 0.37 lb. per head per day on millet hay to 2 lbs. per head per day on clover hay. The ration of stover and clover hay ranked next highest, the average daily gain being 1.67 lbs. per head. When these cattle were pastured during the summer the greatest gain 643 lbs. was made with the lot which had been wintered on the corn and sorghum hay ration and the smallest gain, 479 lbs., by the lot which had been fed corn and clover hay. In general, the author points out that the summer gains were in inverse ratio to the gains made during the previous winter.

In a test which was very similar to the preceding except that alfalfa hay, cowpea hay, and wheat straw and clover hay 1:1 fed with shelled corn were also compared, as well as wheat straw with shelled corn and cotton-seed meal 2:1, the daily gains ranged from 0.94 lb. on the last mentioned ration to 1.94 lbs. on the shelled corn and clover-hay ration. The alfalfa-hay ration ranked next highest with an average daily gain of 1.63 lbs. per head, while with the corn stover and clover hay ration the gain was 1.55 lbs. per head.

In all the above-mentioned tests except two with shelled corn and clover hay the steers were fed at a loss which ranged from 78 cts. with one of the lots fed corn stover and clover hay to $9.89 per steer with the lot fed cotton-seed meal, shelled corn, and wheat straw. The gains on the respective shelled corn and clover hay rations were 14 and 82 cts. per steer. In general, the author notes that the shelled corn and timothy hay ration, which is regarded as a standard and with which the others are compared, proved very unprofitable in every trial and was not to be compared as regards economy of feed with a leguminous hay and corn. Corn and corn stover "proved to be a much poorer combination than did even corn and timothy hay, as might be expected." Corn and millet hay and corn and sorghum hay were also inferior, a result which was not anticipated.

"By substituting clover for timothy in these trials the efficiency of the ration was practically doubled. That is, a bushel of corn when fed in combination with clover hay produced essentially double the number of pounds of gain that were produced on similar steers with the same amount of corn and good timothy hay. What was found to be true of clover applies almost identically to cowpea hay."

Corn, clover hay, and corn stover, as was the case when this coarse fodder combination was fed without grain, produced larger gains than timothy hay of good quality. Satisfactory results were also obtained with alfalfa hay and with cowpea hay. "This means that with a large amount of coarse material like stover to be utilized, one of the most useful materials to feed in connection with it is a limited quantity of clover, cowpea, or alfalfa hay."

When cotton-seed meal was fed as part of the ration "the amount of grain secured was far less than when legume hay was used, such as clover or cowpeas, and in view of the high price of cotton-seed meal, it would not be profitable to attempt to substitute this material for one of the legume hays for the wintering of cattle."

The author notes that gains made with light feeding are relatively costly. The cattle hardly more than kept their weight at best and therefore practically all the feed consumed was wasted, considered from the standpoint of gains made.

"As the ration was increased in amount so that the rate of gain increased the cost of gains diminished uniformly. This seems to be true up to the full limit of the appetite of the animal, or to the point where the animal is on full feed or approximately on full feed. That is, other things being equal, and considering only the cost per pound of gain, the cheapest gains are uniformly made when the animal is on full feed or approximately so."

When cattle are to be grazed during the summer "it is important that they be wintered lightly, or in such a way as not to carry to grass any considerable amount of fat."

Methods of steer feeding, T. I. Mairs (*Pennsylvania Sta. Bul. 83, pp. 16, figs. 3*).—Corn stover and corn silage were compared with two lots of 6 steers each, the grain ration in both cases being broken ear corn with 2 lbs. of cotton-seed meal per head per day. Mixed hay was also fed to both lots.

In the 126 days of the test the average gain on corn stover was 214 lbs. per steer and on silage 240 lbs. The total cost of the corn stover ration was $103.73 and of the corn silage ration $109.91. "Undoubtedly a part of the superior value of the corn silage was due to the ears which it contained, as it is noted that on this feed the steers ate a smaller amount of grain than those fed corn stover."

When cotton-seed meal versus Ajax flakes was compared with 2 lots of 12 steers each for a period of 70 days the average gain on the 2 rations was 118 and 126 lbs., respectively, and the cost of feed per pound of gain was 10.90 cts. with the cotton-seed meal ration and 10.94 cts. with the Ajax flakes. The feeds mentioned were supplemented by broken ear corn, shredded corn stover and mixed hay with an additional amount of cotton-seed meal for a part of the time, the ration being so arranged that the 2 lots received approximately equal quantities of protein.

In a test carried on in continuation of earlier work on the relative merits of barn and shed feeding (E. S. R., 16, p. 398), 2 lots of 12 steers each were fed ear corn with corn stover and mixed hay, supplemented during a part of the period by cotton-seed meal. In 70 days the average gain of the lot fed in the barn was 344 lbs. per steer and of the lot fed in the shed 382 lbs., the cost of feed in the two cases being respectively 8.57 and 8.15 cts.

As the author points out, the results of this test confirm the conclusions of former years, namely:

"Shelter has very little effect upon the appetite of the animals except in extreme weather.

"In this climate it is seldom that the weather is too cold for steers on full feed out doors provided they are kept in dry quarters and out of strong winds.

"It is very essential for fattening steers that they be well bedded.

"It is decidedly advantageous that the yard be macadamized or given an impervious coating of some kind to prevent mud during soft weather. Wet bedding and muddy yards are more injurious than extreme cold.

"The amount of feed required per pound of gain is practically the same whether the steers are kept in a warm basement stable or outside."

Kafir corn and milo maize for fattening cattle, F. R. Marshall and J. C. Burns (*Texas Sta. Bul. 97, pp. 20, figs. 3*).—The authors discuss the feeding value of Kafir corn and milo maize, which they believe could be more extensively used with profit than at present, and report tests in which these materials were compared with other feeds.

In the first of these tests, which covered 76 days, the basal ration consisted of cotton-seed meal, cotton-seed hulls, and sorghum hay, and four lots of 5 steers each were used. The average daily gains per head on the several rations were Kafir corn 2.59 lbs., milo maize 2.20 lbs., Indian corn 2.10 lbs., and molasses (with corn meal) 1.91 lbs. Taking the cost of feeds into account it is pointed out that Kafir corn gave the largest and cheapest gains, while milo maize ranked next, molasses yielding smaller though cheaper gains than Indian corn. "Repetition of this test without another form of roughage might result in a higher rate of gain for Indian than for Kafir corn and milo maize, but for feeding matured cattle a mixed ration similar to that used in this experiment we would recommend the purchase of the lowest priced of these three feeds."

Whole cotton seed and cotton-seed meal as supplements to ground Kafir corn were studied in a test of 84 days' duration with two lots of 50 steers each, Kafir corn stover being used as coarse fodder. The average daily gain per steer on the whole cotton-seed ration was 3.1 lbs. and the cost of feed 6.2 cts., exclusive of the coarse fodder. Similar values for the cotton-seed meal were 2.4 lbs. and 8.8 cts. The cattle were shipped to market, and the average dressed weight was found to be 62 per cent of the live weight. The authors calculate that the Kafir corn meal fed with cotton-seed returned $1.34 per one hundred pounds, and with cotton-seed meal $1.12, these two feeding stuffs costing, respectively, $12 and $26 per ton. "Twelve-dollar cotton seed was more profitable than $26 cotton-seed meal for supplementing a Kafir corn ration."

When different proportions of cotton-seed cake with a mixture of ground milo maize and Kafir corn were compared on a Texas ranch with two lots of 20 steers each, the average daily gain in 182 days was 2.47 lbs. with a mixture containing about 8.5 per cent by weight of the cotton-seed cake and 2.42 lbs. with about 13 per cent of the cake. The coarse fodder (sorghum hay, Kafir corn fodder, milo maize fodder, and some millet hay) was supplied ad libitum to both lots.

At the beginning of this test 25 pigs followed each lot of steers and received no feed except what they could gather. Later in the test grain was fed, about 2,100 lbs. per lot and the number of pigs was reduced. The total pork production was found to be 109.75 lbs. per steer with the smaller proportion of cotton-seed cake and 114 lbs. per steer with the larger proportion. The authors calculate that the beef made per acre of milo maize, based on a yield of 40 bu. per acre, was 418.2 and 422.7 lbs., respectively, for the two rations, and the yield of both beef and pork 497.33 and 508.47 lbs., respectively, while the calculated profit for the two rations, including both steers and pigs, was $263.52 for the smaller proportion of cotton-seed cake and $252.66 for the larger proportion.

According to the authors, Kafir corn and milo maize are not properly appreciated in the feed trade. Both contain considerably less fat or oil than Indian corn. In other constituents the differences are not important. "The authors believe the protein and fat of Kafir corn are much less easily digested than the same constituents of Indian corn."

Some work at other stations is summarized and general suggestions are made to inexperienced feeders.

Beef production, J. H. Skinner and W. A. Cochel (*Indiana Sta. Circ. 8, pp. 8*).—From a general survey of the question of procuring cattle for fattening under local conditions, the conclusion is drawn that the best procedure is to purchase such cattle in southern Indiana, since "there is low freight rate with no expense attached for yardage and commission. The cattle are acclimated and possess capacity and constitution. They are strictly grass cattle and are gentle. . . . If bought direct from the producer of course the freight to the yards and the midleman's profits are saved." The average run of cattle indicate that no particular attention has been paid to breeding, and improvement in this direction is desirable.

Our slaughterhouse system and the German abattoir, C. Cash and H. Heiss (*London, 1907, pp. XII+212, pl. 1, figs. 64*).—A plea for the improvement of slaughterhouse conditions in Great Britain and a description of a modern German abattoir.

Skim milk in calf feeding, A. Pirocchi (*Agr. Mod., 13 (1907), No 35, pp. 493–495*).—A discussion of experiments carried on by the author from which the conclusion was drawn that flour gave the most satisfactory results for supplementing skim milk. Good results were also obtained with corn meal and oleomargarine.

Modern sheep. Breeds and management, W. J. CLARKE (*Chicago, 1907, pp. 342, figs. 101*).—History and breeds, general management, sheep management in the Western States, dressing sheep and lambs for market, diseases, and related topics are considered in this handbook of sheep feeding and management.

The sheep industry in Ontario (*Ontario Dept. Agr. Bul. 161, pp. 24*).—Statistical and other data regarding the sheep industry in Ontario, care and management of flocks, the need of adequate protection of sheep from dogs, and similar questions are discussed on the basis of some 800 sets of replies received in answer to a circular letter of inquiry sent out by the department. Considering the Province as a whole, 34 per cent, or about one-third, of the farmers kept sheep, the average size of the flock being 13 animals.

Included in the bulletin is a general discussion of sheep breeding in Ontario by J. Campbell.

Note on mutton raising at the Mégrine estate, GRAMMOND (*Bul. Dir. Agr., Com. et Colon.* [*Tunis*], *12* (*1907*), *No. 42, pp. 115-120*).—Data are given regarding the feeding, management, and profits of sheep raising in Tunis.

Second annual report of the poultry institute of the Province of Ontario, 1906-7 (*Ann. Rpt. Poultry Inst. Ontario, 2* (*1906-7*), *pp. 158, figs. 3*).—Papers by different authors on a variety of topics connected with the care and management of poultry are included in this report.

Egg production of virgin fowls, J. NELSON (*New Jersey Stas. Rpt. 1906, pp. 354-358, pl. 1*).—In continuation of earlier work (E. S. R., 18, p. 74), the author found in a test covering a year that the average egg yield per hen was 126 in the case of a pen of 10 hens with a male bird and 118 in the case of a similar lot of hens only. Eggs from the two lots were stored and examined at intervals to determine whether there were differences in the keeping qualities of fertilized and unfertilized eggs. They showed large losses in weight by evaporation but so far as becoming spoiled was concerned kept very well. "There was no noticeable difference in the condition of the eggs derived from the two pens."

Hens that have laid two eggs in a day, G. A. DREW (*Science, n. ser., 26* (*1907*), *No. 656, pp. 119, 120*).—In connection with experiments with poultry at the University of Maine it was found that 2 eggs a day were occasionally laid.

Care of poultry in winter, V. FORTIER (*Jour. Agr. and Hort., 11* (*1907*), *No. 6, pp. 137-140*).—A number of rations are suggested for the winter feeding of poultry.

The profitable guinea fowl, P. T. WOODS (*Rel. Poultry Jour., 14* (*1907*), *No. 6, pp. 544-546, figs. 6*).—On the basis of his own experience and that of practical poultry raisers, the author discusses the feeding and care of guinea fowls, methods of slaughtering and dressing, and related questions. Under present conditions guinea raising is regarded as more profitable when followed in connection with other business than as an independent industry.

Experiments with ostriches, J. E. DUERDEN (*Agr. Jour. Cape Good Hope, 30* (*1907*), *No. 6, pp. 791-794, pls. 2; 31* (*1907*), *No. 1, pp. 31-35, pl. 1*).—The investigations reported on the cause of defects (bars) in ostrich feathers led to the following conclusions:

"There is some reason for supposing that the variations in feathers from the same wing are partly associated with injuries or disturbances during quilling. Whether the same feather germ will always produce the same defective or perfect feather yet remains to be determined.

"There being such a great variation among ostriches as regards their tendency to produce defective feathers, the principle of selection in breeding is strongly enforced."

"Ostriches, even in good condition, if exposed to inclement weather, may later show constrictions in their growing feathers, which constrictions will result in bars on the feathers unfolding. Birds kept under shelter during the same inclement conditions are not likely to produce defective feathers.

"The exposure produces a contraction or shrinkage of the skin upon the soft growing feather, the latter being thereby constricted in a ring-like manner, which constriction fails to reexpand after the feather leaves the socket.

"The skin shrinkage does not affect quills, and ripe, or nearly ripe, feathers, as the quill is too firm and hard to respond to the pressure. Bars are produced during the soft growing period of the feather.

"All ostriches are not affected alike by the same unfavorable conditions; some are very responsive, while others are very resistant."

African ostrich industry, R. B. Mosher (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 2981, pp. 1-3*).—Statistical and other data are reported regarding the ostrich industry and the care and management of these birds.

Ostrich raising in French West Africa, Decorse (*Agr. Prat. Pays Chauds, 7 (1907), No. 53, pp. 121-133, fig. 1*).—The possibilities of ostrich raising in French West Africa are discussed and information supplied regarding the care and management of these birds.

Experimental studies in oyster propagation, J. Nelson (*New Jersey Stas. Rpt. 1906, pp. 311-354, pls. 13*).—A progress report of the station's investigations on oyster culture and propagation (E. S. R., 18, p. 73).

The main reason why artificially produced fry did not develop satisfactorily, in the author's opinion, was the use of water of too low density. "The spat which had set before the water became so fresh seemed to stand . . . [low density] surprisingly well. This is to be explained by the fact that the fry now furnished with shells could shut out the water on the lowest tide when it was least dense, and yet on a flood tide was able to secure sufficient food to make a fair growth. It must also be noted that the water on the bottom, where the oysters are, is somewhat denser than at the surface, where most of our density readings were made. . . .

"Our experiments with cultch showed that oyster fry prefer to attach to oyster shells, and that the inner or smooth side is more favorable to attachment than the outer side. But even the outer side is superior to most other objects. Oyster fry do not show great choice as between the upper or lower sides, or the hollow or convex sides of cultch. . . .

"We found it advantageous to wash our eggs before fertilization. We had the remarkable result to secure fry with shells developed, only 12 hours after fertilization. This was partly due to the prevailing high temperature—usually it takes 18 to 24 hours, and if the water is cool the shell stage may even be delayed to the thirty-sixth hour. We have previously called attention to the fact that fry may live and appear lively and normal without shell for days, but such fry will not produce spat.

"On the other hand, we noticed that immediately after hatching, long before there is a sign of a shell, the fry seek the surface and will cluster on any object that projects out of the water, just in the surface of the water. Here they will rest and develop as fast as do the free swimming fry, and get shells; the shells will appear as if on the point of becoming cemented to the cultch. We have not been able to raise these fry to a later stage. The actual attachment was never completed, but the phenomenon is a noteworthy one. Doubtless, fry attach much sooner after hatching than has hitherto been believed, and in that case it must take longer before they have grown to be visible to the naked eye."

DAIRY FARMING—DAIRYING—AGROTECHNY.

Feeding grain to milch cows at pasture, J. H. STEWART and H. ATWOOD (*West Virginia Sta. Bul. 109, pp. 15*).—To study the desirability of feeding grain to cows on pasture, 12 cows "were divided into two lots as nearly similar as possible in milk flow, in age, in length of time they had been in milk, and in length of time until next calving. For periods of 2 weeks one lot of cows received grain, and the other lot did not receive grain. Then the conditions were reversed and the lot which had not been receiving grain was fed grain, and the other lot no grain, and so on."

Three consecutive tests, each continuing 28 days, were completed. One of the proprietary dairy feeds was used for the grain ration. During the time covered by the first test, in June and July, the pasture remained fresh and green, and there was plenty of grass available for the cows. In this test the cows produced 352.75 lbs., equivalent to about 164 qts., more milk when fed the grain in addition to the pasture than without the grain. The grain consumed cost $12.60, making the cost of the extra milk production at the rate of 7.6 cts. per quart. The cows also made larger gains in live weight during the period with grain than in that without it.

During the second test the grass was short and affected both the yield of milk and the weight of the cows. In this period the cows produced 332.5 lbs., or practically 155 qts., more milk with the grain than without it, but the increased milk production cost 8.1 cts. per quart. The cows lost less weight while fed grain than without it.

In the third test the grass in the pasture became so short that it was necessary to supply additional forage. For this purpose cowpeas were used, being cut as required. In this case the increased milk production amounted to 210 lbs., or 98 qts., so that the extra milk cost nearly 13 cts. per quart to produce. In this test, also, the grain had a favorable influence on the live weight of the cows.

In conclusion, from the results the authors state that "this experiment clearly shows that there was no direct financial gain in feeding the grain to the cows while at pasture. It is true that the cows which received grain were uniformly in somewhat better flesh than those that did not receive grain, but as far as the milk yield was concerned the increased flow was produced at an actual loss." Data obtained in similar experiments at other stations are summarized, and from these in comparison with their own investigations the authors conclude "that unless dairy products are especially high in price it is not a profitable practice to feed grain to cows at pasture. It is true that more milk is obtained and the cows hold up their yield better and remain in better flesh when receiving the grain rations, but under ordinary circumstances there is no direct profit from the grain feeding, as the increased production usually costs more than it can be sold for."

Record of the dairy herd, G. A. BILLINGS (*New Jersey Stas. Rpt. 1906, pp. 305–310*).—Individual records of yields of milk and butter fat are given for 2 years. The variation for different cows and for the same cows in different years is very noticeable. The average return for two years from the 5 best cows of the herd in value of milk produced was $67, and that of butter $43, greater than from the 5 poorest cows.

Dairy herd record for ten years, A. L. HAECKER (*Nebraska Sta. Bul. 101, pp. 1–27, figs. 5*).—Records are given for the yearly production of milk and butter fat by each cow in the herd for 10 years. During this period the herd has changed from time to time, so that in all 63 cows have been included. One cow has continued in the herd throughout the whole period, one has been included for 7 years, and several for 5 and 6 years. The others ranged from this to 1 year. In all 160 complete records have been obtained. These data cover a great variation in breeds, feeding, and handling of the animals, and the individual records show variation in the production of different members of the herd in a given year and also variation from year to year by certain cows.

From the data summarized the author draws the following deductions:

"As a rule, short lactation periods result in a high percentage of fat, while long periods give a lower percentage of fat.

"A large flow of milk is generally associated with a low percentage of fat, while a small flow gives a higher test. It was found, however, that the amount of butter fat did not vary as much as the milk flow or the percentage of fat.

"In most cases heifers with their first calf did not show as high a test as they did at a more mature age.

"The percentage of butter fat did not seem to be changed by the food ration given.

"In order to know the value of a dairy herd and its members, it is necessary to keep a milk and butter fat record of each cow from year to year. Such a record will show great variation in the value of the animals and will serve as a guide in building up the herd.

"The cows varied from year to year in their butter fat production. The good cows were inclined to give large yields year after year, while the poor ones were in nearly all cases low.

"It was found that, as a rule, the variation in milk flow in individual cows from year to year was due to length of lactation and rest before freshening. A long lactation period favors a larger milk production; also, a long period of rest before freshening brings the same result."

Cost of butter fat production, A. L. Haecker (*Nebraska Sta. Bul. 101, pp. 28-38, figs. 2*).—From the records for the consumption and yield by individual cows in a herd for 10 years (see above) the data for the years 1905 and 1906 have been summarized, so as to show the average cost of production of butter fat.

This was not a test of any special method of feeding or management, but "the foods used were chosen as being desirable for dairy animals and were balanced as to their nutritive parts. The market price of the foods used was considered in choosing the grain mixture, care being taken to make the ration as cheap as possible and at the same time palatable and nutritious. The roughage was made up of alfalfa and corn, silage during the winter months, with bluegrass and white clover pasture during the summer. The corn silage was made from corn cut up while in the early dent stage with at least two-thirds of the stalks bearing ears. The amount of silage given depended upon the capacity of the animal and the amount of grain it received. The grain was given according to the amount of milk the animal produced and its capacity to use the feed without laying on flesh."

In 1905 the cost of feed ranged from $22.16 to $41.48, the average cost per cow for a herd of 25 being $30.98. In 1906 the herd included 27 cows, 2 of which were given extra heavy grain rations because of unusual productive capacity. Omitting these 2 cows from the average, the range for the remaining 25 cows was much the same as in the preceding year and the average was $30.68, or 30 cts. more than that of 1905. The average profit per cow was $43.54 in 1906, as compared with $41.93 for 1905.

The following conclusions are drawn from the study of all the data:

"The amount of milk and butter fat produced depends upon the dairy capacity of the animal and the amount and quality of the ration used.

"Cows vary in their cost of keep, also in their ability to use economically the food consumed.

"Cows of a decided dairy type will return the greatest profit when fed to their full capacity.

"The average cost of feeding a dairy cow, as shown by these records, is about $30 per year, and the total value of butter fat is about $70, leaving an average of about $40 for labor and profit in addition to the value of the skim-milk and the value of the calf."

Cost of producing milk, G. A. BILLINGS (*New Jersey Stas. Rpt. 1906, pp. 298–304*).—In a herd containing 35 cows one year and 34 the next the average yearly production per cow for the 2 years was 6,348 lbs. of milk, averaging 4.32 per cent fat, which would yield 320 lbs. of butter. The cost of feed per cow averaged $46.19, making the cost of 100 lbs. of milk, not including that for labor, 72.78 cts. At $1 per 100 lbs. for the milk the average return per cow would be $17.29 for the year. At 18 cts. per pound for butter it would be $11.41. Under these conditions the cow must produce 4,619 lbs. of milk, or 257 lbs. of butter, to pay for the food she eats. The only profit, if any, for labor expended would be in the manure. The manurial value of the feeds purchased for these herds is computed.

Maple Spring dairy, W. J. FRASER (*Illinois Sta. Circ. 113, pp. 16, figs. 11*).—A popular account of the success achieved by a dairy farmer, cooperating to some extent with the agricultural experiment station, in applying the scientific principles of dairying in his actual farm practice.

A city milk and cream contest, C. B. LANE and I. C. WELD (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 117, pp. 28*).—The details are given of a contest among a considerable number of dairymen in Cleveland, Ohio, in the production of clean, wholesome milk and cream, and also in the management of dairy farms. This is believed to be a practical method of improving city milk supplies.

The selection and milking of dairy cattle (*Bd. Agr. and Fisheries [London], Leaflet 187, pp. 8*).—A summary of information for popular instruction.

The dairy association and the eradication of tuberculosis of cattle, R. OSTERTAG (*Ztschr. Fleisch u. Milchhyg., 18 (1907), No. 2, pp. 41–50*).—In this paper, which was presented at the third international dairy congress at The Hague, 1907, the extent to which dairy cattle are infected, the importance of this fact to the dairy industry, and the methods for combating and eliminating the disease from the dairy herd are considered.

Report of the experiment station and dairy institute at Kleinhof-Tapiau in 1906–7, HITTCHER (*Ber. Vers. Stat. u. Lehranst. Molkw. Kleinhof-Tapiau, 1906–7, pp. 17*).—Summaries are given of the activities of the institution in various lines during the year.

Dairy laboratory guide, C. W. MELICK (*New York, 1907, pp. IV+129, figs. 52*).—The author states that this manual is published for the benefit of dairy short courses. It begins with the most elementary work, and touches only the practical side with which every dairy or creamery operator should be familiar.

Practical dairy bacteriology, H. W. CONN (*New York and London, 1907, pp. XI+314, pl. 1, figs. 86*).—This book is stated by the author to be designed for dairy students and for all who are interested in dairy products from the standpoint of their production, their distribution, or their consumption. It combines the practical with the theoretical. The first and largest part of the volume gives a general discussion of facts concerning the bacteria of milk and dairy products, and the second part gives directions for bacteriological analyses and methods of bacteriological study.

Acid production by Oidium lactis, W. Rullman (*Centbl. Bakt.* [*etc.*], *2. Abt., 18* (*1907*), *No. 24–25, pp. 743–748*).—In experiments with sterilized milk inoculated with a pure culture of *Oidium lactis*, the acid increased decidedly on keeping the milk for considerable periods at room temperature and at 22° C., but at 37° C. it decreased and the organisms eventually died. The results obtained in these tests are compared with those of other investigators.

The effect of moderate heating upon rennet ferment, M. Siegfeld (*Milchw. Zentbl., 3* (*1907*), *No. 10, pp. 426–430*).—The author found that heating rennet solution to about 40° C. weakens the strength of the ferment, the destructive effect being increased with continuation of heating. This appeared to be due to hydrolytic action.

Experiments were also made in which the solutions were diluted not with water but with a 10 per cent solution of sodium chlorid, and with a saturated solution. Heating the 10 per cent salt solution containing the rennet ferment to 40° was about half as destructive as heating the water solution to the same temperature, but in the case of the saturated solution the activity of the rennet was reduced only about 10 to 14 per cent. The author suggests that the higher resistance of the rennet ferment in the saturated solution may be due to the relatively large quantities of sodium chlorid present.

The ferments of milk and their relation to pasteurization, R. G. Freeman (*Jour. Amer. Med. Assoc., 49* (*1907*), *No. 21, pp. 1740–1742, dgm. 1*).—The author applies the deductions from the results of recent investigations on the presence and action of ferments in milk to the problem of artificial feeding of infants. He concludes: "(1) Milk for infant feeding should be pasteurized so as not to interfere with its biologic properties or chemical composition, but at a sufficient temperature to destroy the bulk of the bacteria present, including the tubercle bacilli. (2) A temperature of 140° F. (60° C.) continued for 40 minutes would seem to fulfill this condition."

The relative rate of growth of milk bacteria in raw and pasteurized clean milk, E. Q. St. John and M. E. Pennington (*Jour. Infect. Diseases, 4* (*1907*), *No. 4, pp. 647–656*).—Pasteurized milk was rendered bacteriologically comparable with the original milk by reinfecting it with the residue obtained by centrifuging some of the raw milk and drawing off the supernatant liquid.

At room or refrigerator temperature the reinfected pasteurized milk curdled sooner than the raw milk, and the former showed a marked increase in bacteriological content over that of the latter. The experiments led the author to conclude that "there is a restraining power for ordinary milk organisms in raw milk, lasting at least to the curding point. This condition is either not present or is reduced in milk which is heated to 79° C., a temperature below that required to destroy its oxidizing action. This restraining power seems to apply to the organisms commonly found in milk in the combinations ordinarily present there."

Italian soft cheeses, G. Cornalba (*Coltivatore, 53* (*1907*), *Nos. 43, pp. 524–527; 45, pp. 581–584; 46, pp. 625–629; 49, pp. 713–717*).—Different Italian soft cheeses are briefly described and their analyses are reported.

Investigations on goat's milk, E. Ujhelyi (*Milchw. Zentbl., 3* (*1907*), *No. 10, pp. 430–435*).—Experiments with 12 goats were made in continuation of similar investigations previously reported. The average milking period for the 12 goats was 270 days. The average quantity of milk per goat was 1½ liters per day. The average of the individual fat tests, made monthly according to the Gerber method, was 4.52 per cent. The average composition of the milk for the whole 9 months was, water 85.62 per cent, fat 4.77 per cent, protein

4.28 per cent, milk sugar 4.50 per cent, and ash 0.82 per cent. The specific gravity was 1.0329.

[Unfermented apple juice], S. H. Shank (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 3035, p. 7*).—A note regarding the manufacture of pure apple juice free from alcohol is given, and includes the result of the chemical analysis of the product.

Chemical investigations of musts and wines made of sound and diseased grapes, A. Beneschovsky (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 9, pp. 685-703*).—From the investigation of a large number of samples of musts and wines made from sound grapes and grapes from vines afflicted with Peronospora, Oidium, and brunissure, the author concludes that (1) grapes afflicted with Peronospora produced wine with less alcohol and therefore of smaller value, and (2) that wines from diseased grapes have as high an average content of extract as those from sound grapes.

Wood distillation, W. C. Geer (*U. S. Dept. Agr., Forest Serv. Circ. 114, pp. 8*).—A popular publication prepared for use in answering inquiries regarding commercial distillation of hardwood and softwood and the quantity of the products obtained. It explains briefly the processes of destructive and steam distillation, the apparatus employed, the resulting products, and the uses of the latter.

VETERINARY MEDICINE.

The unsuspected but dangerously tuberculous cow, E. C. Schroeder (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 118, pp. 19, figs. 7*).—It has been shown that the interval between infection and the time when tubercle bacilli are disseminated by cows is long enough to permit a dairyman to keep his herd free from dangerously tuberculous cows by means of an annual tuberculin test. This test gives no information as to the extent to which cattle are affected, and it is impossible to determine at any stage that a tuberculous cow is not dangerous. For practical purposes, therefore, it is necessary to assume that every tuberculous cow is dangerous from the moment of infection.

According to repeated tests and bacteriological examinations the commonest way in which tubercle bacilli leave the body of infected cattle is in the feces. An examination of 172 samples of milk sold in the District of Columbia showed that 70 per cent of these samples contained cattle feces. The presence of feces in milk from tuberculous herds is conclusive evidence that the milk also contains tubercle bacilli.

The physical appearance of cows is no indication of the extent of infection. The dangerously tuberculous cow may continue to look and behave like a perfectly healthy animal for several years, during all of which time she distributes tubercle bacilli in her feces or milk. Illustrations are given to show the healthy appearance of 7 dangerously tuberculous cows, 6 of which were removed from dairy herds furnishing milk to the District of Columbia. The injection of minute quantities of the feces of these cows was sufficient to produce generalized tuberculosis in guinea pigs. About 40 per cent of cattle which react to tuberculin are dangerous, for the reason that they distribute tubercle bacilli in the feces or by other means. The butter made from milk soiled with the feces of one of these cows produced tuberculosis in guinea pigs, and the virulence of the tubercle bacilli in the butter was not diminished after a period of 49 days.

Origin of tuberculosis, J. Bongert (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 29, pp. 405-408*).—The literature relating to tuberculous lesions is reviewed with particular reference to the work of J. Bartel and E. von Behring. The lungs are considered as more exposed than any other organ to infection with tuberculosis. There may be a primary infection by inhalation, or a secondary infection may arise by extension from some other organ. Moreover, the pulmonary tissue is less resistant than the mucous lining of the intestines. A quantity of tubercle bacilli too small to produce infection in the intestines may give positive results if injected into the trachea.

Comparative experiments with inhalation and alimentary tuberculosis, II. Findel (*Ztschr. Hyg. u. Infectionskrank., 57 (1907), No. 1, pp. 104–153*).—Experiments were undertaken to determine the relative ease of infection with tubercle bacilli through the lungs and the alimentary tract. The experimental animals were guinea pigs, dogs, and a calf. The bacilli were introduced into the lungs through a healed tracheotomy wound. The danger of infection through the alimentary tract was found to be very slight as compared with that through the lungs. With dogs it was found that 1,200 times as large a dose is required to cause infection through the digestive organs as through the lungs.

In the case of guinea pigs the difference was even greater. Young guinea pigs proved more susceptible to pulmonary infection than adults. A dose of 62 tubercle bacilli in the lungs produced infection in every case and frequently positive results were obtained from 20 bacilli. A dose 19,000 times as great failed to cause infection through the intestines. In one comparative test the infectious alimentary dose was 6,000,000 times as large as the pulmonary dose. The author believes that his results may be applied to other animals and to man, and that the danger of alimentary infection is very slight.

Atypical cases of tuberculosis, F. Henschel (*Ztschr. Fleisch u. Milchhyg., 17 (1907), No 11, pp. 377–383*).—It is held that the occurrence of cases of tuberculosis with an atypical course does not render it necessary to examine the intermuscular lymphatic glands in all cases of tuberculosis. The author admits that occasionally the meat inspector passes carcasses of beef and pork which nevertheless show tuberculous intermuscular glands.

Skin reaction to tuberculin, F. Arloing (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 27, pp. 247, 248*).—Previous experiments by the author gave unsatisfactory results with this method. In another test dogs and goats failed to give good skin reactions, but reacted in the usual manner to subcutaneous injections of tuberculin.

Application of von Behring's method of immunizing cattle against tuberculosis, G. A. Billings (*New Jersey Stas. Rpt. 1906, pp. 359–367*).—A brief review is given of some of the results obtained from the application of von Behring's vaccination method on the control of bovine tuberculosis. This method was applied to 7 calves and 2 adult cattle, all of which were vaccinated on February 24 and again on May 28. The records thus far kept of the behavior of these animals indicate a slight temperature disturbance in two of them, due probably to the presence of an incipient tuberculosis.

Combating bovine tuberculosis with bovovaccine and tauruman (*Arch. Deut. Landw. Raths., 31 (1907), pp. 121–149*).—The results obtained in Mecklenburg-Strelitz and also in Argentina from the use of bovovaccine and tauruman have been variable. In one instance 8 out of 9 cattle vaccinated according to the method of von Behring proved later to be tuberculous as shown by the tuberculin test. The method needs to be tested more extensively.

Leucocytosis in cattle, Utendörfer (*Arch. Wiss. u. Prakt. Tierheilk., 33 (1907), No. 4–5, pp. 329–371*).—The number of leucocytes in the blood of cattle varies with age, being greatest in young cattle. Sex and castration have no influence upon the number. As a rule there are more eosinophilous cells in cattle than in man. There is no leucocytosis during digestion or pregnancy. The udder produces specific nutrient substances which have an influence upon the formation of eosinophilous cells.

A leucocytosis appears during the progress of tuberculosis, but just before death from this disease the number of leucocytes falls below normal as a result of the action of toxins in the blood. The relative importance of different kinds of leucocytes is not changed during tuberculosis. Tuberculin also causes leucocytosis even in healthy cattle, with an increase in the number of eosinophilous cells. Leucocytosis in tuberculosis or after tuberculin injection is believed to be due to the elevation of body temperature. The animal is considerably protected by the increase in the number of leucocytes.

Johne's disease in cattle, J. T. Angwin (*Vet. Rec., 20 (1907), No. 993, pp. 36-38*).—Johne's disease seems to be on the increase in England. The symptoms are those of diarrhea, which persists sometimes for 18 months, especially if the cows are on pasture. The best remedies are sedatives mixed with wheat flour. The disease is often mistaken for tuberculosis, but the tuberculin test will give a differential diagnosis. Tannic acid, subnitrate of bismuth, and liquor arsenicalis give good results in Johne's disease but not in tuberculosis. The lesions of the disease are very slight, perhaps the most conspicuous being a thickening of the intestinal walls. The lymphatic glands appear normal to the naked eye but may be enlarged. There is no intestinal ulceration. Infection seems to come with the food.

Mammary hematomata and mammitis, P. Braun (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 30, pp. 581-584*).—The symptoms of mammitis are described with particular reference to a case which resulted from a bruise upon the udder. An extensive blood clot and hematoma were formed. The milk from the affected quarter of the udder was at first dark brown and later dirty white. At the beginning of the inflammatory condition the fat content of the milk rose to 7 per cent but later fell to the normal. Antiseptic salves and the internal use of potassium iodid brought about a recovery.

Coma and paralysis in cattle not always milk fever, G. E. Gibson (*Vet. Rec., 20 (1907), No. 995, pp. 74, 75*).—Clinical notes are given on a disease which affected 6 heifers and 1 steer. The steer and one of the heifers died while the others recovered. The heifers had never been bred, but the udders showed much inflammation and contained considerable milk. The symptoms resembled those of milk fever.

Unsuccessful coenurus operation, Duetsch (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 28, pp. 543-545*).—In one instance of gid in a steer the bladder worm could not be located by percussion of the skull. The skull was trepanned and one bladder found, but all parts of the worm could not be extracted. It became necessary to slaughter the steer on the next day when it was found that there was a second bladder worm on the other side of the brain.

Cattle dipping in arsenite of soda (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 6, pp. 629, 630*).—It is reported that the systematic dipping of cattle at the rate of 5 lbs. per 100 gals. of water practically freed a badly infested farm from *Amblyomma hebræum* and *Rhipicephalus decoloratus*.

Dehorning cattle, C. L. Willoughby (*Georgia Sta. Cir. 63, pp. 12, figs. 3*).—A general account is given of the benefits which accrue from the hornless condition of cattle, particularly dairy cows, and the results obtained by various investigators in dehorning cattle and in determining the loss in weight and milk flow from the operation are summarized.

The methods commonly used in dehorning cattle are carefully described. These include the use of caustic potash on the horn buttons of calves and the removal of the horns of adult cattle by means of dehorning clippers or the saw. It is wise to select as the time for dehorning adult cattle a season when the temperature may not be at extremes. Bad results from dehorning may be largely prevented by the use of suitable antiseptic solutions applied to the wounds. The author also considers in this connection the prevalent superstitions regarding hollow horn and hollow tail.

Interrelation of creameries and animal plagues, Matthiesen (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 31, pp. 433–436*).—It is recommended that creameries be not allowed to accept milk from dairies in which any infectious disease prevails. All skim milk should be pasteurized before delivery to patrons, and care must be exercised to make the pasteurization effective. All milk utensils must be scrupulously cleaned.

Polyvalent serum in vaccination against calf dysentery and swine plague, Vonnahme (*Berlin. Tierärztl. Wchnschr., 1907, No. 30, p. 567*).—The authors vaccinated 120 calves with polyvalent serum with complete success in every case. Previously about 90 per cent of the calves in the same neighborhood had become affected.

Polyvalent serum gave equally good results in protecting pigs against swine plague. The method used was that of Ostertag and Wassermann. The cost of the protection thus afforded was very slight.

The regulation of vaccines, F. Kern (*Berlin. Tierärztl. Wchnschr., 1907, No. 28, pp. 542, 543*).—Careful distinction should be made between vaccines which do or do not contain living virus. The use of vaccines should be under government supervision and should be in the hands of specially designated veterinarians. Other persons should not be allowed to use vaccines, and veterinarians should be required to follow scrupulously the approved directions for their use.

Hemotoxins of the anthrax bacillus and related bacteria, H. Heyrovsky and K. Landsteiner (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 44 (1907), No. 2, pp. 150–160*).—No success has hitherto attended attempts to isolate a toxin from the anthrax bacillus. The authors had no success from the use of ordinary media, but a hemotoxin was obtained when in the place of bouillon a medium was used containing 0.5 per cent salt and 1 per cent nutrose in meat extract. It was found that the hemotoxin obtained in this medium was largely neutralized by the peptone in ordinary bouillon. In the preparation of the anthrax lysin the best results were obtained on a bouillon containing 0.5 per cent salt and 0.12 to 0.25 per cent chapoteaut peptone. The lysin showed a strong hemolytic effect on the blood of rabbits and man but was less active toward the blood of guinea pigs, mice, and cattle. The anthrax lysin is thermolabile and very susceptible to the action of cholesterin.

In a similar manner hemotoxins were obtained from *B. subtilis*, *B. mycoides*, and *B. megatherium*.

Bacillus pyogenes and the tissue changes caused by it, H. Holth (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3 (1907), No. 1–2, pp. 155–217*).—A detailed account is given of the morphology, biology, and resisting powers of *B. pyogenes*. This bacillus is most frequently associated with streptococci, staphylococci, necrosis bacillus and coli bacillus. Rats and pigeons are immune, but rabbits are very susceptible to it. In cattle a phlegmonous tumor is produced. The bacillus is also pathogenic for sheep, goats and pigs, and in the pure pyemic form of infection in pigs nearly all the organs may be affected. *B. pyogenes* is frequently found in broncho-pneumonia and metritis of cattle. It is never the primary cause of mammitis but is often associated with other micro-organisms in cases of this disease.

A comparative study of Bacillus pyogenes bovis and B. pyogenes suis, E. Berger (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3 (1907), No. 1–2, pp. 101–154, figs. 4*).—As the result of an extensive bacteriological study the author comes to the conclusion that Poels' polyarthritis bacillus, the *B. pyogenes suis* of Grips and *B. pyogenes bovis* are identical. To simplify the nomenclature it is recommended that the name *Bacillus pyogenes* be used. *B. pyogenes* and the bacillus of abortion seem not to be closely related. In many animals *B. pyogenes* forms pus, but not in dogs. It is possible to immunize small laboratory animals, dogs and calves, against *B. pyogenes* and to obtain from them an immune serum, which contains agglutinins and bactericidal substances.

Local phenomena in passive immunity toward swine erysipelas, A. JAROTZKY (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig.*, *44* (*1907*), *No. 1, pp. 77–89, figs. 7*).—It is an exceedingly difficult matter to determine whether there is present in the blood and lymph of animals a soluble cytase. The experiments reported by the author showed the great importance of the phagocytes in destroying the bacilli of swine erysipelas. Even if there be a free solution of complement in the body fluids, it takes little part in destroying the bacilli, since their destruction is brought about in the interior of the phagocytes.

The source of Bacillus suipestifer, K. GRABERT (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3* (*1907*), *No. 1–2, pp. 218–225*).—In 7 out of 23 pigs in perfect health and showing no evidence of hog cholera the author found bacteria which could not be distinguished from *Bacillus suipestifer* morphologically, biologically, or culturally. It appears, therefore, that this organism may sometimes occur in a nonvirulent form.

The resisting power of Bacillus suisepticus and B. suipestifer, D. ERDÖS and E. KOPPÁNYI (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3* (*1907*). *No. 1–2, pp. 226–234*).—*Bacillus suipestifer* shows a much greater resisting power to ordinary disinfectants than *B. suisepticus*. The author presents in a tabular form the comparative resistance of these two bacteria to alcohol, peroxid of hydrogen, chloroform, formaldehyde, boric and other acids, lime, etc. Both organisms are quite susceptible to the action of copper sulphate, lime, and creolin.

The etiology of hog cholera and swine plague, F. HUTYRA (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3* (*1907*), *No. 1–2, pp. 235–243*).—The author holds the view that both the intestinal and pectoral forms of hog cholera are due to a filterable virus but that pure swine plague is caused by *Bacillus suisepticus*.

Vaccination against swine plague, BECHER (*Berlin. Tierärztl. Wchnschr., 1907, No. 29, pp. 551, 552*).—The use of suptol gave good results in curing all cases of swine plague except those in which an extensive degeneration had already taken place in the lungs and liver. The protective power of this vaccine also proved to be relatively high.

Hygienic defects of pigpens, K. EVERS (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3* (*1907*), *No. 1–2, pp. 30–68, figs. 15*).—Details are given for the sanitary construction of farm buildings, particularly pigpens. The lack of protection against cold and dampness is considered the chief defect of such structures. The results obtained from vaccination experiments to prevent hog cholera and swine plague were unsatisfactory where the pens were cold and damp.

Annual report on the cases treated in the clinics of the royal military farrier during 1906, E. KRÜGER (*Ztschr. Veterinärk., 19* (*1907*), *No. 8–9 pp. 345–359.*)—During the year under report 255 horses were treated for diseases of the eye, alimentary tract, skin, legs, and feet. These diseases included chiefly wounds of the eye, keratitis, flesh wounds, fistula, abscesses, herpes, corns, toe cracks, quittor, etc. Brief notes are given on the treatment adopted and the results obtained.

Infectious anemia in horses, R. OSTERTAG (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3* (*1907*), *No. 1–2, pp. 1–29*).—The geographical distribution of infectious anemia of horses in Germany is outlined together with notes on a number of cases observed by the author. A considerable amount of virus is necessary to produce infection. An occasional wisp of contaminated hay or forage may be eaten with impunity.

In controlling the disease it is necessary to have regard for the quality of the water and feed. Horses brought in from outside sources should be carefully inspected and diseased animals must be isolated. The symptoms are weakness, inanition, paleness of the mucous membranes, diminution of the red blood corpuscles, fever, and edema of the skin. The excretions of diseased animals are virulent. Infection takes place through the alimentary tract.

Does blackleg occur in horses? R. OSTERTAG (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3 (1907), No. 1–2, pp. 95–100*).—Supposed cases of blackleg in horses were examined with the result that no blackleg bacilli but rather pseudo-blackleg bacilli were found. No evidence was obtained to support the supposition that blackleg may affect horses.

Equine malaria, P. PERRUCCI (*Clin. Vet. [Milan], Sez. Sci., 30 (1907), No. 4, pp. 159–185, pls. 2*).—This disease is widely distributed about Rome and occurs under various forms. Petechiæ appear on the conjunctiva and on the pituitary and oral mucous membranes. Vesicles appear on the lips soon after the beginning of the disease. Equine malaria may be transmitted directly by injections of the blood of affected horses. The period of incubation is usually 5 or 6 days. Ordinarily fever precedes by 2 or 3 days the appearance of hemoglobinuria.

Skin and eye reaction to mallein, A. PUTZEYS and T. STIENNON (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 27, pp. 245, 246*).—A serious outbreak of glanders in army horses gave an occasion for testing the skin and eye reaction to mallein. Mallein was instilled into the eye or rubbed into skin abrasions. Of 6 horses which received mallein in the eye only 3 showed a slight redness of the conjunctiva. Almost no reaction was obtained in scarifications of the skin. These methods, therefore, appear to possess little or no diagnostic value.

Purulent and gaseous material in the guttural pouches of horses, D. BERNARDINI (*Clin. Vet. [Milan], Sez. Prat., 30 (1907), No. 28, pp. 453–458, figs. 2*).—This trouble is not common in horses. The author describes the anatomy of the guttural pouches and gives details of one case in which they became enormously enlarged as a result of infection with bacteria which produce pus and gas.

Curative serum for tetanus, HEUER (*Ztschr. Veterinärk., 19 (1907), No. 8–9, pp. 359–366*).—From the literature of the subject statistics are given on the results obtained from the use of tetanus antitoxin in several thousand cases in horses. In general this treatment has proved to be of little value, since the symptoms of the disease can not be recognized soon enough. Protective vaccination is recommended in all cases of surgical or accidental wounds in regions where tetanus prevails. Antitoxin for curative purposes, however, has been found too expensive and too uncertain in results.

Vaccinating mules against horse sickness, RICKMANN (*Arch. Wiss. u. Prakt. Tierheilk., 33 (1907), No. 4–5, pp. 372–420*).—Mules in South Africa are as susceptible as horses to this disease. Several mules were immunized by gradually increasing doses of virulent blood. Serum from these immune mules gave excellent results in protecting susceptible mules against the disease. It is recommended that mules be vaccinated at a season when horse sickness does not naturally prevail. It is possible that the passive immunity produced by serum will not prove satisfactory, in which case resort must be had to a method of active immunity. Probably the same method will be successful with horses.

An outbreak of epizootic gastro-enteritis in dogs, H. SUMNER (*Vet. Rec., 20* (*1907*), *No. 994, pp. 55–58*).—The disease is less common than distemper. It affects all ages and breeds of dogs. The pathogenic organism belongs to the pasteurella group. The mortality varies from 15 to 75 per cent and the course of the disease from 1 to 28 days. The symptoms include intestinal pain, contraction of the abdominal muscles, violent vomiting, and bloody diarrhea. The mucous lining of the stomach shows an intense inflammation, and in some cases the brain membranes are hyperemic. Treatment is of no avail in acute cases. In the chronic form ice packs about the head and the administration of arsenical liquor and bromid of potash gave good results.

Sublymphatic leukemia in dogs, A. JAEGER (*Berlin. Tierarztl. Wchnschr., 1907, No. 30, pp. 563–566*).—In cases of this disease the cervical glands become enlarged, but no other external symptoms are to be observed. The ratio of white to red blood corpuscles is 1:300. On post-mortem examination all the lymphatic glands are found to be enlarged. The spleen and liver are but slightly changed in size, and the bone marrow is unusually soft and contains an enormous number of lymph cells. The author draws a distinction between granular and lymphatic leukemia.

Rabies studies, C. FERMI, G. TIZZONI, and A. BONGIOVANNI (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 44* (*1907*), *No. 1, pp. 23–32*).—Filtration of rabies virus through a Swedish filter of 1 to 4 layers prolonged the period of incubation in animals inoculated with the filtrate, and one rabbit did not become infected at all. *Bacillus pyocyaneus, B. prodigiosus*, spores of fungi, and amœba are also able to pass through several layers of the filter.

Experiments with 43 laboratory animals showed that the cerebro-spinal fluid of animals dead of rabies is not virulent when it is obtained entirely free from nerve tissue. Neither the saliva nor salivary glands were found to be virulent in any case.

In order to decompose rabies virus with salts of radium it is necessary to use aluminum tubes rather than glass.

The virulence of the saliva and salivary glands of rabid animals, C. FERMI (*Arch. Farmacol. Sper. e Sci. Aff., 6* (*1907*), *No. 6, pp. 327–331*).—The saliva of dogs, rabbits, rats, etc., dead of rabies did not always prove to be virulent. The author did not succeed in transmitting rabies to mice by the bites of rabid rats or dogs. Mice also proved to be unsusceptible to the saliva of rabid dogs.

Histological changes in pseudo-membranous enteritis in cats, E. SCHMUL (*Arch. Wiss. u. Prakt. Tierheilk., 33* (*1907*), *No. 4–5, pp. 445–460*).—In the course of this disease the intestinal follicles become contracted and infiltrated, and finally undergo necrosis, the walls of the intestines become thickened, rigid, and transparent, and hyperemia is observed in the liver and kidneys.

Polyneuritis in fowls, J. MAREK (*Deut. Tierärztl. Wchnschr., 15* (*1907*), *No. 30, pp. 417–421, figs. 2*).—A nervous disease of fowls resembling beri-beri is known in India. The author describes four cases of polyneuritis in roosters in Budapest. The chief symptom is a progressive paralysis of the legs. The nerves supplying the affected parts are greatly changed, often showing an almost complete disappearance of the nerve fibers. The cause of the disease is unknown.

In treating polyneuritis of fowls some benefit may be derived from massage of affected parts, and from the administration of sodium salicylate and bone meal.

Septicemia of fowls caused by coli bacillus, L. CLAUSSEN (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 3* (*1907*), *No. 1–2, pp. 69–94, pl. 1*).—Coli bacilli in the intestines of healthy fowls possess the power of becoming virulent under certain circumstances and of producing a septicemia in chickens and other fowls. This occurs especially as a result of shipment. The virulence may be increased by repeated passage through canary birds. The septicemia is thus produced in more than 50 per cent of cases. The period of incubation is about 12 hours. The disease may be transmitted by contact and by feeding. Chickens, pigeons, ducks, and canary birds are susceptible to artificial inoculation, and to a lesser extent white mice, guinea pigs, and rabbits.

Occasionally this disease may be mistaken for fowl cholera. In such cases it is necessary to make bacteriological cultures to reach a differential diagnosis.

A vegetable extract as a vaccine for fowl cholera, RAUTMANN (*Berlin. Tierärztl. Wchnschr., 1907, No. 29, pp. 552, 553*).—A proprietary extract made from a mixture of several plants and recommended as a vaccine for fowl cholera was tested with the result that it showed neither protective nor curative value. As compared with serum treatment in parallel experiments it proved to be worthless.

Notes on experiments with blackhead of turkeys, C. CURTICE (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 119, pp. 10*).—A series of experiments were made in cooperation with the Rhode Island Station with Bronze, White Holland, Narragansett, and wild turkeys for the purpose of determining the possibility of immunity to blackhead and the conditions under which infection takes place. It was shown that turkey eggs do not carry the protozoan organism of the disease. Young and adult turkeys show symptoms of blackhead within 4 weeks after exposure. Poultry yards appear to be quite extensively infected with blackhead, but with proper precautions turkeys may be raised to the small roaster stage with little or no loss.

Dry sandy soils appear to be best for poultry yards. No breed of turkeys so far as tested is immune to blackhead, but older birds are more resistant than the young.

Notes on parasitic nematodes, including descriptions of new genera and species and observations on life histories, B. H. RANSOM (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 116, pp. 7*).—Biological and economic notes are given on Trichostrongylus, Ostertagia, Cooperia, and Nematodirus, the last three of which are described as new.

Strongyloides longus, which was observed as a common parasite of sheep at the experiment station of the Bureau of Animal Industry, was found capable of penetrating through the skin of rabbits, causing an infestation of the alimentary tract. Infestation took place as readily through the skin as when the larvæ were fed to rabbits. It appears, therefore, that this parasite is transmissible from sheep to rabbits either by penetration through the skin or as a result of eating contaminated food. It was shown by experiment that *Trichostrongylus retortæformis* may be transmitted directly from rabbit to rabbit without an intermediate host.

RURAL ENGINEERING.

Cement pipe for small irrigating systems and other purposes, G. E. P. SMITH (*Arizona Sta. Bul. 55, pp. 167-184, figs. 6*).—This bulletin calls attention to the great losses of water from open ditches in the sandy soil of Arizona and recommends carrying the water in pipe lines to prevent these losses. It describes the making of cement pipes for such use, giving the mixture used, the cost, and the results obtained. The cost of pipe made of cement and sand and of cement, lime, and sand is given in the following table. Since the pipe was made near a river where both sand and water were available no charge is made for either of these.

Cost per 2-foot length of 15-inch pipe.

	Cement-sand.	Cement-lime-sand.
Cement, at $1.50 per bbl	$0.563	$0.375
Cement, hauling 7 miles	.035	.023
Lime, at $13 per ton, delivered		.058
Sand, no charge		
Water, no charge		
Labor, foreman, $2 per day, 2 laborers, at $1.25 per day	.112	.112
Wash of neat cement	.060	
Cost per 2-foot length	.770	.568
Cost per linear foot	.385	.284
Cost per mile	2,032.800	1,499.520

On the basis of the value of water in Arizona it is computed that the carrying of water in underground pipes rather than in open ditches will yield a large return on the cost of pipe.

Sand-clay and burnt-clay roads, W. L. SPOON (*U. S. Dept. Agr., Farmers' Bul. 311, pp. 22, figs. 5*).—This has been noted from another source (E. S. R., 18, p. 485).

RURAL ECONOMICS.

The unproductive farm (*U. S. Dept. Agr., Office Sec. Circ. 25, pp. 8*).—This is an address by the Secretary of Agriculture at a convention called by the Chamber of Commerce, Syracuse, N. Y., in October, 1907.

A more economic use of the soil, the maintenance of pastures, rotation of crops, liberal use of fertilizers, the culture of crops adapted to particular regions, and the planting of naturally poor lands with trees are the chief suggestions made to improve present farm conditions.

Is New York agriculture decadent? W. H. JORDAN (*N. Y. Tribune Farmer, 6* (*1907*), *No. 313, pp. 2, 3*).—This is an address delivered before the Syracuse Chamber of Commerce in October, 1907, by the director of the New York Agricultural Experiment Station.

The author calls attention to the diminished number of farms in the State, the decrease in value of farm property, the falling off of rural population, and the decreasing percentage of farms worked by owners according to the census returns. Notwithstanding these facts the claim is made that, on account of changed agricultural conditions during the past half century, the agricultural tendency in the State of New York has been upward, resulting in a constantly increasing production of wealth in dairy products, fruits, vegetables, flowers, and plants.

In the author's opinion the problems relating to agriculture in New York are sociological and educational rather than economic, in the solving of which the State government ought to play an increasing part in the future. "The problem is socially to integrate the country homes," and road improvement, better rural schoolhouses, and a broader rural education are advocated as means to this end.

Abandoned farms, G. H. WEBB (*Ann. Rpt. Comr. Indus. Statis. R. I., 20* (*1906*), *pt. 3, pp. 1-187*).—In an account of Rhode Island industries and industrial opportunities, descriptive notes are given of the size, character, location, and assessed valuation of abandoned farms. The total number in 1906 located in 25 counties is 328.

The Italian on the land: a study in immigration, EMILY F. MEADE (*Bur. of Labor* [*U. S.*] *Bul. 70, pp. 473-533*).—This paper discusses the economic, social, and moral condition of the Italians of a typical rural settlement at

Hammonton, N. J., "in order to show what the southern Italian—the lowest class of immigrant—can do to advance himself in the midst of an American farming community."

The topics discussed include the Italians as fruit growers, farmers, and in industry, their acquisition of property, standard of living, social relations, etc. From this study the author believes that the Italian is a desirable acquisition to this country, that the solution of the problem of assimilating such immigrants lies in establishing them in country districts where the climate and products are suited to their constitutions, and that the South, where the need of farm labor is greatly felt, offers a field for their labor as a substitute for northern Europeans.

The results of investigations on the profitableness of agriculture (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), Nos. 8, pp. 977–987; 9, pp. 1103–1120*).—Detailed statistical data regarding the incomes from different size farms in Switzerland for the quinquennial period 1901 to 1905 are reported and discussed.

The average annual income from farms averaging 13.81 hectares (about 35 acres) was 6,595 francs. The total average annual income from 662 exploitations was 4,303 francs, expenditures 3,189 francs, which gave a total average annual increase of wealth from each farm of 1,114 francs (about $217).

Studies in rural economics and legislation, R. Worms (*Études d'Économic et de Législation Rurales. Paris, 1906, pp. VIII+304*).—This is a compilation of the author's addresses, reviews of books, discussions, etc., relating to agricultural economy and legislation delivered before learned societies from 1899 to 1905. The papers are grouped under general topics dealing with rural economics, agricultural laborers, proprietors, and organizations, the circulation of agricultural wealth, and agricultural instruction and research.

English agriculture and the new act (*Economist, 65 (1907), No. 3345, pp. 1667, 1668*).—A discussion of the main provisions of the new Small Holdings and Allotments Act, the purpose of which is "to reestablish the small cultivator by providing him with a few acres at a reasonable rent and with security of tenure." For the first quarter (January, 1908) of the operation of the act Parliament has appropriated £100,000.

Some considerations relating to the position of the small holdings in the United Kingdom, W. G. S. Adams (*Jour. Roy. Statis. Soc., 70 (1907), No. 3, pp. 411–448*).—This paper discusses: (1) The statistical evidence as to the number and size of small holdings in the United Kingdom; (2) certain changes in agricultural economic conditions affecting the small-holding problem, such as the shrinkage of the area of tillage, the increase in agricultural imports, and the changes of agricultural prices; and (3) conditions essential to the economic development of a small farm holding.

An appendix contains a statement regarding the acreage under crops, live stock, implements, receipts and expenditures, and net returns of a 20-acre farm of good average land well cultivated. While under present conditions the holder of 20 acres of average land appears to receive an annual net return of from £30 to £70, under a proper system of management which the appendix illustrates the 20-acre farm is believed to be capable of yielding a net income of about £85. This income, with house and garden free, makes the lot of the small holder vastly superior to that of the ordinary industrial worker.

The paper is followed by a discussion.

Credit to agricultural cooperative societies, R. Worms (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 7, pp. 659–676*).—The author discusses the law of December 20, 1906, authorizing loans to agricultural cooperative societies.

Two defects in the law are noted: (1) That it permits short-term loans only, and (2) that no provision for securing a loan is made for the small farmer who is isolated and not a member of a cooperative association.

Agricultural mutual credit banks in 1906 (*Bul. Statis. Lég. Compar., 31 (1907), No. 8, pp. 172-176*).—At the close of 1906 the district banks numbered 76, a gain of 10 over 1905, and had advanced from the government funds 22,985,381 francs, an increase of 3,717,530 francs. Interest varies from 3 to 4 per cent, with a tendency toward the lower rate. The local banks affiliated with the district banks numbered 1,638 with 76,188 borrowers, gains of 283 and 14,314, respectively. Loans outstanding amounted to 25,409,195 francs. Tabulated data are presented of the condition of the local credit banks in each department of France as to number, borrowers, invested capital, and loans granted.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 1, pp. 1-8*).—The usual statistical data on the condition, acreage, yields, and prices of agricultural products in the United States and foreign countries are summarized and discussed.

Agricultural statistics of Ireland, with detailed report for the year 1906, W. G. S. Adams (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1906, pp. XXXVIII+166*).—This report presents a detailed and comparative record of the acreage and yields of crops, the number and classes of breeding stock, land holdings, and forestry operations, the number and estimated production of creameries, malt houses, and grain and scutch mills, and the rates of agricultural wages.

Agricultural statistics, Ireland, 1906-7, W. G. S. Adams (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1906-7, pp. 14, dgms. 17*).—This is a compilation of the prices in Ireland of live stock and other agricultural produce for the year ended June 30, 1907, in comparison with similar data for preceding years.

The production and trade in cereals of various countries (*Bol. Leg. e Statis. Dog. e Com., 24 (1907), Apr. 1, pt. 2, pp. 225-270; Apr. 16, pt. 2, pp. 271-312; May 1, pt. 2, pp. 313-349*).—These numbers contain statistical data with discussion of the production, exportation, and importation of wheat, rye, barley, oats, corn, and other cereals by the chief commercial nations of the world for the year 1906, in comparison with similar data for preceding years.

AGRICULTURAL EDUCATION.

The common schools and the farm youth, L. H. Bailey (*Century, 74 (1907), No. 6, pp. 960-967, figs. 2, dgm. 1*).—This is a discussion of what the farm school can do for the farm youth in the way of teaching them how to live. This, the writer thinks, will come about largely through the teaching of nature study and elementary agriculture, which are at present treated more or less as separate subjects, but will not necessarily be so treated when such subjects as geography, arithmetic, reading, and manual training are so "redirected" as to deal first and primarily with the concrete things entering into the everyday experience of the children.

The article deals with the status of the nature study movement, some objects of nature study, methods of nature study, results to be expected from nature study teaching, and the application to country schools.

The teaching of agriculture in rural schools, J. Main (*Ill. Agr., 11 (1907), No. 9, pp. 326-331*).—This is a plea for the introduction of agriculture into existing public high schools in preference to the establishment of agricultural high schools. A course in agriculture to extend over two years of high-school work is outlined.

The development of secondary agricultural schools, F. STAUDACHER (*Land u. Forstw. Unterrichts Ztg., 20 (1906), No. 3-4, pp. 191-198*).—A discussion of the functions of the school farm and other equipment in instruction work and of the relation between the school-room instruction and the field practicums, with suggestions concerning the part that should be taken by the principal of the school, the teacher of agriculture, and the farm superintendent in this instruction. The article also takes up matters relating to other subjects in the regular curriculum of the secondary schools, as well as the instruction in supplementary courses. Attention is given to difficulties arising from lack of uniformity in salaries, period of employment of teachers, and "stipends" to enable teachers to go on trips of observation to other schools and important agricultural institutions and enterprises.

Demonstrations and practicums on agricultural secondary school farms, F. SCHINDLER (*Land u. Forstw. Unterrichts Ztg., 20 (1906), No. 3-4, pp. 199-208*).—Arguments are presented in favor of supplementing theoretical instruction with practicums and demonstrations. The qualifications of the successful teacher are discussed, and suggestions are given for developing practicums and demonstrations on the school farm.

The development of meadow culture schools in Bohemia (*Land u. Forstw. Unterrichts Ztg., 20 (1906), No. 3-4, pp. 236-243*).—The article deals with the origin of the movement for instruction in meadow culture, the opening of two schools at Eger and at Hohenmauth in 1906-7, and the rules and regulations governing them. The course of study extends over two years with two semesters each year. This course is given in detail, and the importance of this class of schools is discussed.

Regulations for dairy apprentice instruction in the Rhine Province (*Landw. Ztschr. Rheinprovinz, 8 (1907), No. 38, pp. 536-538*).—These are regulations recently promulgated by the Chamber of Agriculture of the Rhine Province, under which dairies subscribing to the regulations will be allowed to give apprentice work in dairying.

Provisional schedule of studies for forest apprentice schools (*Min. Bl. K. Preuss. Verwalt. Landw., Domänen u. Forsten, 3 (1907), No. 10, Anz. Beilage, pp. 331-335*).—Suggestions in detail from the Prussian Ministry of Agriculture, Domains, and Forests for courses of instruction in forest apprentice schools.

Certain uses of the school garden, ANNE WITHINGTON (*Trans. Mass. Hort. Soc., 1907, I, pp. 79-87*).—An address delivered before the Massachusetts Horticultural Society, February 16, 1907.

The school garden is considered in its educative rather than its economic aspects. It is considered one of the best of school agencies to awaken the latent faculties of the child, to develop such habits of doing and habits of thinking that any vocation to which the gifts of the pupil justify his aspirations may be worthily filled, and to furnish training for the motor faculties and knowledge of useful operations which were formerly acquired in the home but which now. "save for the knowledge country children acquire on the farm . . . has passed from the ken of school children."

Attention is called to the modern trend in education as indicated by the changed attitude on the part of the older educational institutions toward the kind of scientific knowledge demanded by modern industry, notably as indicated by the establishment of a chair of agricultural science in Oxford University.

The school garden serves a purpose not only in the education of the school children but also in the bringing about of improvements of economic and esthetic value throughout the whole community, such, for example, as an increase in the number of home vegetable gardens among poor working people and the large increase in the use of flowers and vines in decorating the homes.

Rural domestic science courses in Moravia, K. KOLB (*Land u. Forstw. Unterrichts Ztg., 20 (1906), No. 3-4, pp. 209-216*).—A description of agricultural domestic science schools itinerant in nature which are conducted in the German and the Bohemian sections of Moravia.

For the German section there is one itinerant instructor in domestic science who holds annually two courses of 4 months each, which embody practical training in home making and theoretical instruction in domestic science, accounts, correspondence, nursing, etc., and many farm operations, such as the feeding and care of live stock, dairying, etc. Each course accommodates from 12 to 15 pupils who have graduated from the public schools. The localities in which the schools are held are required to furnish a building properly lighted and heated, and the necessary live stock to be used in the instruction.

In the Bohemian section there are two instructors in domestic science, each of whom holds four courses of 10 weeks each. These courses are usually held in connection with agricultural winter schools under the direction of the principal of these schools or occasionally in connection with public schools. The course of study in the Bohemian section includes more of theoretical instruction and goes into ethics and the theory of education. The writer criticises the schools on this account, and thinks that they would be more serviceable if conducted on the plan of the schools in the German section, except that he thinks it an advantage to have the schools conducted under the direction of the principals of fixed schools.

Outlines for topical study on domestic science, MARGARET BLAIR (*Boston Cooking-School Mag., 12 (1907), No. 2, pp. XVIII, XX*).—This is the first of a series of four study outlines. It relates to foods—their selection, preparation, use, cost, value, and adulteration.

Study outline on household art, MARGARET BLAIR (*Boston Cooking-School Mag., 12 (1907), No. 3, pp. XVIII, XX*).—This outline relates to the home dwelling—its location and principal rooms, including the basement, kitchen, dining room, living room, hall, bathroom, bedrooms, closets and clothes presses, and the attic. A list of references is given.

Syllabus of illustrated lecture on farm architecture ELMINA T. WILSON (*U. S. Dept. Agr., Office Expt. Stas., Farmers' Inst. Lecture 8, pp. 19*).—This lecture deals with different styles of farm houses, including a discussion of furnishings for the more important rooms, plumbing, fireplaces, and inclosed porch and back doors; the relation of the house to its surroundings; other structures, such as the dairy, ice-house, poultry houses, barns, hog houses, and fences; and the remodeling of houses. Forty-eight lantern slides have been prepared to illustrate the lecture, and a list of references to architectural literature is given.

Syllabus of illustrated lecture on tobacco growing, J. N. HARPER (*U. S. Dept. Agr., Office Expt. Stas., Farmers' Inst. Lecture 9, pp. 15*).—In this lecture brief historical references are followed by a discussion of the various stages in the culture, harvesting, and curing of tobacco, and of the injury to tobacco by diseases and insects. Forty-six lantern slides have been prepared to illustrate the lecture, and the syllabus contains 28 references to literature on tobacco.

MISCELLANEOUS.

Annual Report of Florida Station, 1907 (*Florida Sta. Rpt. 1907, pp. LXII+VIII*).—This includes the organization list of the station, a financial statement for the year ended June 30, 1907, a general review of the work of the station during the year, including a description of the new station farm and buildings, and reports of the animal industrialist, chemist, entomologist, assistant plant pathologist, assistant in botany, and librarian, a list of periodicals received by the station, and a subject list of the station publications to date. Much of the experimental work noted in the reports of the officers is abstracted elsewhere in this issue.

Annual Report of New Jersey Stations, 1906 (*New Jersey Stas. Rpt. 1906, pp. XXI+670*).—This includes the organization list of the stations, a financial statement of the State station for the fiscal year ended October 31, 1906, and of the college station for the fiscal year ended June 30, 1906, a report of the director reviewing the different lines of station work, and departmental reports abstracted elsewhere. A report on the inspection of feeding stuffs has been previously noted (E. S. R., 17, p. 1101), as has also one on the inspection of Paris green (E. S. R., 18, p. 458). Brief notes are also given of meteorological data for the year, feeding experiments with milch cows, and the successful treatment of a case of milk fever.

[**Index to bulletins and reports of Hatch Experiment Station, 1888–1907**] (*Massachusetts Sta. Index Number, 1907, pp. 48*).—This is an index of bulletins and reports issued by the Hatch Experiment Station of the Massachusetts Agricultural College, from its organization to its change of name to Massachusetts Agricultural Experiment Station in 1907.

[**Index to Wyoming Station publications**], GRACE R. HEBARD (*Wyoming Sta. Index Bul. D, pp. 38*).—Lists of the publications of the station since its organization, and a subject index to Bulletins 54–75, issued from July, 1902, to July, 1907.

Accessions to the Department Library, July September, 1907 (*U. S. Dept. Agr., Library Bul. 65, pp. 56*).

Science at work, W. FELTHWAITE and J. S. REMINGTON (*London, 1907, pp. 83, pls. 11*).—This pamphlet contains brief discussions of the following subjects: Science and the land; farmers, landowners, and seed merchants; seed testing; manure and oil-cake makers; science and the miller; the farmer and the weather; agricultural cooperation; and science at work. A brief account of the Aynsome Seed Testing Station and Laboratory in England is included.

Recent progress in agriculture, A. BRUTTINI (*Bol. Quind. Soc. Agr. Ital., 12* (*1907*), *No. 20, pp. 876–901*).—Progress in agricultural meteorology, soil investigations, fertilizer experiments, agricultural mechanics, irrigation and hybridization and selection of plants is reviewed.

NOTES.

Hawaii Station.—Chester J. Hunn, a recent student at Cornell University, has been appointed assistant in horticulture, and took up his work March 1.

Illinois University and Station.—At the third annual convention of the State Florists' Association an account of the work in floriculture recently inaugurated at the station was presented by Director Davenport, together with a paper on Our Experiment Stations and What We Have Done, by A. C. Beal, assistant in floriculture.

Indiana Station.—Seed corn and soil improvement special trains have been operated this spring by the station in cooperation with railways of the State.

Iowa College.—*Iowa Agriculturist* states that a plant introduction garden has been established at Ames in cooperation with this Department, and that J. H. Allison, of the University of Missouri, has been appointed assistant in this and orchard work.

Louisiana University.—R. S. Cocks, professor of botany and bacteriology, has resigned to accept a new position at Tulane University, and has been succeeded by H. L. Shantz, of the Missouri University and Station.

Minnesota University.—A summer school for teachers, school principals, and superintendents is to be held June 8–27, to meet the demand for agricultural instruction by those who wish to teach the elements of agriculture or to superintend the teaching of it in the public schools.

Nebraska University and Station.—Hon. C. J. Ernst, president of the Board of Regents, has resigned.

A western branch of the seed-testing laboratory of this Department has been established at the station, to facilitate quicker returns.

South Dakota Station.—Clifford Willis, first assistant in soil physics in the Illinois Station, has been appointed chief of the department of agronomy in the place of E. C. Chilcott, who came to this Department several years ago. A new substation has been established in the northern part of the State.

Virginia College and Station.—The legislature has passed an act establishing a State Geological Survey, and locating the work at the University of Virginia. The act transfers to the university work originally organized in 1904 and successfully carried on for several years at the Virginia Polytechnic Institute. A commission consisting of the governor, the presidents of the University of Virginia and the Virginia Polytechnic Institute, and two appointees of the governor is to have charge of the work. As authorized, the powers of this commission include an examination of the geological formations of the State, road-building materials, streams, water powers, water supplies, and other physical features with special reference to their utilization, an examination and classification of soils, and a study of their adaptability to particular crops, the preparation of maps and special reports bearing upon the geology and natural resources of the State, and the consideration of such other scientific and economic questions as in the judgment of the commission are deemed of value to the people of the State.

Wisconsin University.—New four-year courses leading to the degree of Bachelor of Science are being offered for the training of analytical, industrial, agricultural and soil, sanitary and food, and physiological chemists. The course for the sanitary and food chemist will include work in the bacteriology and biology of water supply, the microscopic examination of foods and drugs, food chemistry, toxicology, physiological chemistry, vegetable histology, and water and gas analysis; and that for the agricultural and soil chemist will consist of work in dairy chemistry, agricultural chemistry, soil chemistry, agricultural bacteriology, physical chemistry, botany, and soil bacteriology.

Experiment Stations in Portuguese East Africa.—The Portuguese Government has authorized the establishment of a series of experiment stations in the State of East Africa or Mozambique. This region covers nearly 300,000 square miles on the east coast directly opposite Madagascar, and has a population of about 3,000,000. Although under the jurisdiction of Portugal it is in large part controlled by British syndicates. Its resources are believed to be very great but are at present largely undeveloped. O. W. Barrett, formerly entomologist and plant pathologist of the Porto Rico Station, and at present connected with the Seed and Plant Introduction of this Department, has accepted a two-year appointment to organize these stations, and will enter upon his duties at once.

Agricultural work in Manchuria.—According to a note in *Science*, Chum Zen Chan, a graduate of the College of Agriculture of the University of California, has been made director of the agricultural experiment station at Mukden, Manchuria. It is also stated that a school of forestry is to be established at Mukden, under the direction of a Japanese expert, but that this institution has not yet been opened owing to lack of funds.

Agricultural Education and Research in Brazil.—A National Congress of Agriculture, held at Rama, Brazil, to consider means for the improvement of agricultural conditions in that country, has recommended the establishment of a separate department of agriculture to consist of sections of statistics and rural economy, animal industry, botany, chemistry, agricultural meteorology, microscopy and bacteriology, soils, forestry, pomology, field crops, textile fiber crops, entomology, horticulture, ornithology and game, public roads and transportation, domestic and foreign markets, and publications. The congress also recommended the establishment of a system of agricultural colleges and experiment stations similar to that in this country, the reorganization of agricultural fairs, the establishment of agricultural banks, a number of cooperative enterprises, and other economic measures.

Agricultural Instruction Abroad.—The Professional School of Agriculture which has been located at Chievres, Belgium, since 1903 has been transferred to Ath. It offers theoretical and practical instruction during the months of December, January, and February. A diploma is awarded to pupils who pass the examination at the end of the course. A similar school was opened last year at Braine-le-Comte, and 22 pupils received diplomas at the close of the first course.

L'Industrie Laitiere of December 1 gives a brief history of traveling dairy schools in France and Belgium, a description of the Belgian type of this school, and the course of study offered.

The National School of Horticulture, Versailles, France, received 50 new students this year, the largest number since its organization. Owing to its constantly increasing attendance, the minister of agriculture has this year established a course in rural engineering as applied to horticulture, and a course in vegetable pathology.

A new agricultural winter school was opened December 1 at Gradlitz, in Bohemia. The school is in charge of Franz Windirsch, and has an attendance of 21 pupils.

The Statistical Register of the Colony of the Cape of Good Hope for 1906 states that for the year ended June 30, 1906, $1,455 was expended in the colony for instructors in domestic economy, $62,274 for private farm schools, and $14,763 for native industrial institutions. There were 645 private farm schools, as against 529 in 1905, 461 in 1904, and 448 in 1903.

American Nature-Study Society.—This society was organized at Chicago, January 2, for the advancement of all studies of nature in elementary schools. It has taken over the *Nature-Study Review* as the official organ of the society and purposes sending it to its members upon payment of the regular annual dues. The Council for 1908, which will also have charge of the *Nature-Study Review*, consists of the following officers: President, L. H. Bailey; vice-presidents, C. F. Hodge, F. L. Stevens, V. L. Kellogg, W. Lochhead, F. L. Charles; directors, D. J. Crosby, C. R. Mann, S. Coulter, H. W. Fairbanks, M. F. Guyer, O. W. Caldwell, G. H. Trafton, F. L. Clements, Ruth Marshall, C. R. Downing; and secretary, M. A. Bigelow.

Dry Farming Congress.—The second session of the Trans-Mississippi Dry Farming Congress was held at Salt Lake City, January 22-25, with nearly 600 delegates and visitors in attendance. An interesting program was presented, the speakers being largely the State and National investigators from the various dry farming districts. It was voted to issue a report of the proceedings and other bulletins, and to publish a treatise on dry farming. The next session will be held at Cheyenne, Wyo.

Meteorological Notes.—According to *Symon's Meteorological Magazine*, the Australian government is to organize a meteorological bureau to have control of the weather service of the entire commonwealth. The bureau is to be under the direction of H. A. Hunt, with headquarters at Melbourne.

Science notes the establishment by a number of German government bureaus and scientific societies of a series of meteorological stations in Asia Minor and Mesopotamia. It is expected that these stations will supply data as to the meteorological conditions of the high plateau ,and mountain land of the Taurus system, and of the plateau and steppes as well as the alluvial region of the Tigris Euphrates.

With a view to encouraging the teaching in the schools of facts relating to weather and climate, the Royal Meteorological Society announces prizes to elementary teachers and others for essays in the form of original nature study lessons on these topics.

Forestry Notes.—The Bureau of Forestry of the Philippine Islands has been reorganized into divisions of forest administration and forest investigation. The former, in charge of H. D. Everett, will have control of the administrative features of the Government forests, which include practically all the timber lands in the Archipelago. The division of forest investigation, under the direction of H. N. Whitford, is to ascertain the forest resources of the Islands. For the determination of valuable areas a detailed system of mapping has been inaugurated, and plans are to be made for their profitable utilization. Over 1,100 species of trees have been identified in the Islands, and the museum now includes about 3,500 specimens, representing nearly 350 species, including all the principal timber trees.

The senior class in forestry at the Yale Forest School is to spend the spring term on the tract of a large lumber company in Coosa County, Ala. A topographic map will be made with estimates of stands, and a plan will be developed for the profitable management of the tract. Attention will also be given to methods of logging, sawmill operations, grading and handling lumber, and office management.

There has been added to the curriculum of this school a course of lectures on the National forests, to be given to the senior class during the winter term by W. B. Greely, a graduate of the school. Four lectures will be given weekly on the policy of the National forest administration, the organization of the administrative force, the construction of rangers' headquarters, roads, trails, bridges and telephone lines, the protection of National forests from fire, the sale and cutting of National timber, including a discussion of the forestry methods which have been found applicable, the administration of grazing lands and use of stock ranges within the National forests, special uses of National forest land for home building and commercial enterprises, tree planting on the National forests, the handling of claims and entries under the public land laws, and the preparation of National forest records and accounts. These lectures will be supplemented by two hours a week of consultation between small groups of students and the instructor, by which the student will be given first-hand acquaintance with typical administrative cases and methods.

The February number of *Forestry and Irrigation* gives a brief account of the work of the Summer School of Forestry at Antioch College, Yellow Springs, Ohio. The course was conducted by Prof. J. J. Crumley of the college.

Hugo A. Winkenwerder, who has been in charge of the section of education in the Forest Service, has accepted a position with Colorado College as professor of forestry, vice J. Fred Baker.

Measures before Congress.—A bill has been recently introduced authorizing the Commissioner of Education, upon the approval of the Secretary of the Interior, to conduct special investigations respecting industrial education, rural schools, agricultural and mechanical colleges, higher education, the construction and equipment of school buildings, the hygiene of education, the welfare of children as affecting educational efficiency, educational legislation, the records and accounting of educational systems and institutions, and other subjects in education, and appropriating $40,000 for the purpose. Another bill seeks to extend the franking privilege, under certain restrictions, to include any printed letters, circulars, documents, pamphlets, or literature relating exclusively to agriculture which may be issued by or under the authority of any agricultural college or agricultural experiment station in any State or Territory of the United States.

Among other measures are bills to establish an agricultural experiment station at Dickinson, N. Dak.; certifying 7,682 acres of public lands in Kansas to that State for the use of the agricultural college in lieu of a previous selection of that amount which was found to lie within the limits of a railroad grant; for the erection of a cold storage building for this Department; providing rules and regulations governing the importation of nursery stock and fruits into the United States, and for the inspection of nursery stock destined for interstate commerce or export; for the extension of the work of the Office of Public Roads and the Bureau of Soils; and appropriating $1,750,000 for an addition to the new agricultural building of this Department.

New Journals.—The Weather Bureau of this Department has begun issuing a quarterly, *Bulletin of the Mount Weather Observatory*, to contain accounts of its researches at Mount Weather, Va. Volume 1, part 1, contains an announcement as to the scope of the publication, a statement as to the origin and purpose of the Mount Weather Observatory, and illustrated articles on the methods and apparatus used in obtaining upper-air observations, numerical results of kite flights, and the use of upper-air data in weather forecasting.

Iowa Horticulture, "a monthly bulletin of plant life," is being issued by the Iowa State Horticultural Society. The initial number contains addresses presented before a number of horticultural societies, and brief articles and notes on a variety of horticultural topics.

L'Amateur de Champignons has been established as a nontechnical journal on mushrooms and mushroom growing. Eight numbers are to be issued yearly.

Bulletin de la Société Portugaise de Sciences Naturelles is being issued at Lisbon. The initial number contains a statement regarding the society, its constitution and membership, accounts of several of its meetings, and articles presented, of which several relate to trypanosomes.

Boletin de la Camara Agricola de Fernando Poo is the monthly organ of the Chamber of Agriculture of the island.

The Extension is a new periodical on agricultural education issued monthly by the North Dakota College, the January number being the first issue.

Referee Board on Foods.—A Referee Board on Foods has been appointed by President Roosevelt to render a final decision on any matters of controversy which may arise in the administration of the national pure food and drug law. The personnel of this board as recently announced is as follows: Ira Remsen, president of Johns Hopkins University, chairman; R. H. Chittenden, dean of the Sheffield Scientific School and professor of physiological chemistry in Yale University; J. H. Long, professor of chemistry in Northwestern University Medical School; A. E. Taylor, professor of pathology in the University of California, and C. A. Herter, professor of physiological chemistry in the College of Physicians and Surgeons, New York City.

Miscellaneous.—A rice experiment station is to be opened at Vercelli, Italy, during the present month.

A bequest of about $180,000 has been made to the University of Manchester for the establishment and maintenance of a professorship of cryptogamic botany.

Dr. R. H. Lock, of Cambridge University, has been appointed assistant director of the Royal Botanical Gardens, Peradeniya, Ceylon.

Dr. Ludwig Jost, of Bonn, has accepted the professorship of botany at the University of Strassburg as successor to Solms Laubach.

According to a note in *Science*, Rev. J. B. McClellan has resigned the principalship of the Royal Agricultural College, Cirencester, after more than a quarter century's service.

A recent issue of the *Wiener Landwirtschaftliche Zeitung* notes the death, on January 21, of Dr. Ernst Kramer, director of the Agricultural Chemical Experiment Station for Carniola, at Laibach.

A recent number of *Deutsche Landwirtschaftliche Presse* states that because of lack of room for expansion, necessitated by the great increase in its work, the agricultural experiment station at Marburg is to be removed to Cassel, where it is to be connected with the pomological institute at Oberzwehren. In view of this removal the director has been enabled to take advantage of a loan of $59,500 through the Chamber of Agriculture of Hesse-Cassel.

According to *Mark Lane Express*, "The National Society for Agriculture in France has awarded to Monsieur Grandeau—who may be called the grand old man of agricultural science in France—a gold medal. This is an exceptional honor awarded to him in consideration of the great services rendered by him for more than fifty years to agricultural science, in the study of problems connected with animal and vegetable physiology, and as editor of the *Journal d'agriculture pratique*, a journal known throughout the world for its accurate information in connection with agriculture."

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EXPERIMENT STATION RECORD.

VOL. XIX. APRIL, 1908. No. 8.

The recent meeting in this city of the Department of Superintendence of the National Education Association evidenced the growing interest in agricultural education among the educators of the country. It was a recognition also of the position it has attained, which entitles it to a place in the deliberations of the great national association.

The conventions of this Department of Superintendence are among the most important annual gatherings of educators in the United States. They bring together in large numbers the school officers charged with shaping the policy of the schools and administering their funds, the State and county superintendents of public instruction, presidents of colleges and normal schools, superintendents and supervisors of county and city schools, principals of high schools, teachers, and publishers of text-books. At the Washington meeting nearly 1,600 persons were in attendance, representing every State and Territory except Arizona, Nevada, and Porto Rico. It is a matter of considerable significance, therefore, that this body adopted a resolution declaring its belief "in the great value of the study of agricultural subjects in the schools of the rural districts."

The meeting was of importance furthermore from the organization of a Department of Rural and Agricultural Education, as a new department of the National Education Association, coordinate with the existing departments. The movement in this direction has been on foot for several years, promoted by leading representatives of agricultural instruction who felt that the subject was entitled to representation in the national association, that it was broad in its interests, touching those of education in general, and that it would gain much from association with so representative a body, as well as from the opportunity afforded for a broad discussion of its problems and relationships.

The establishment of the new department was authorized by the board of directors of the association at the meeting in Los Angeles last July. Little more than an organization was effected at the

Washington meeting. The officers elected were E. C. Bishop, deputy State superintendent of public instruction of Nebraska, president; D. B. Johnson, of Rockhill, S. C., vice-president, and E. E. Balcomb, of Weatherford, Okla., secretary.

The programme of the meeting of the Department of Superintendence was given up very largely to agricultural and other features of industrial education. The Assistant Secretary of Agriculture and the United States Commissioner of Education in their greetings at the opening session referred to the growing interest and importance of agricultural education, and the former gave the principal address at the first evening session, his subject being Agricultural Industries and Home Economics in the Public Schools. In this address Professor Hays showed the feasibility of providing a unified scheme of instruction in agriculture and home economics, extending from the primary grades through the high school to the agricultural college; and explained the purpose and probable effect of pending legislation for the encouragement by the Federal Government of mechanic arts and home economics in city schools, and agriculture and home economics in agricultural high schools.

On the third day of the convention the forenoon session was devoted to a round table on agricultural education. D. A. C. True, of this Office, outlined broadly the educational work of the U. S. Department of Agriculture. Dr. E. E. Brown, U. S. Commissioner of Education, in giving some notes on the training of teachers of agriculture, reiterated his conviction that this subject must eventually be taught in practically all schools for country children, and discussed pending legislation for the encouragement by the Federal Government of instruction in agriculture, mechanic arts, and home economics in State normal schools. He pointed out that Federal aid to colleges of agriculture and mechanic arts in the United States had, in his opinion, led to greatly increased local appropriation for those institutions, or at least had not tended to diminish local taxation—a result which had been feared by opponents of Government aid to education.

The training of teachers of agriculture was also discussed by J. R. Kirk, president of the State Normal School at Kirksville, Missouri, and K. L. Butterfield, president of the Massachusetts Agricultural College. The latter outlined plans of cooperation between the State agricultural college and one of the State normal schools in Massachusetts, for the training of teachers of agriculture.

The Oklahoma plan to introduce agriculture into all the public schools of that State was discussed by the State Superintendent of Public Instruction, Hon. E. D. Cameron. D. J. Crosby, of this Office, read a paper upon Cooperation Between the U. S. Department of Agriculture and State School Authorities to Promote Agricultural

Education, in which the present status of cooperation was described and lines of future endeavor were pointed out. This was discussed by E. C. Bishop, Deputy State Superintendent of Public Instruction in Nebraska, who outlined the Nebraska plan of cooperation between the State Department of Education and the State university in promoting agricultural education in the public schools.

The papers presented at this round table and the earnest discussions following each paper indicated that educators realize that the movement for agricultural education, not only in colleges but in secondary and elementary schools, is going forward so rapidly that it presents many serious problems to the school authorities in the several States. One of the most troublesome of these problems is to train a sufficient number of teachers for the work in such a way as to give the proper point of view and proper balance to the teaching of this new subject. There was also abundant evidence that the great majority of educators have no clear conception of agriculture as a subject of study, nor of its possibilities and limitations in the public schools.

The two great problems in the agricultural education movement, as pointed out in this journal a year ago, are to define the limitations of the subject for schools of different grades, and to prepare teachers who shall know agriculture and know how to teach it. The first of these problems is being studied by this Department and by the Association of American Agricultural Colleges and Experiment Stations through its committee on instruction in agriculture; the second is receiving attention in about 42 per cent of the agricultural colleges and 35 per cent of the State normal schools. These and other like problems are also to be considered by the new Department of Rural and Agricultural Education, which was organized at the close of the round-table conference.

The training of teachers for industrial work and means of promoting legislation giving Federal aid to State normal schools for this purpose was the only important subject considered by the National Committee on Agricultural Education, which was one of the organizations to hold meetings with the Department of Superintendence.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

A suggestion for a new unit of energy, H. P. ARMSBY (*Science, n. ser., 26 (1907), No. 672, pp. 670–672; Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 164–167*).—In a paper read before the Society for the Promotion of Agricultural Science, May, 1907, the author proposes that a new unit, the therm, be adopted for 1,000 kilogram-calories. Such a unit, he points out, would be very convenient in expressing the energy value of rations in discussions of food and feeding problems, as it would do away with the large numbers necessary in the present system. Illustrations are given of the convenience of the use of this unit in expressing the energy value of rations made up of common feeding stuffs.

Our present knowledge regarding the heat of evaporation of water, A. W. SMITH (*Mo. Weather Rev., 35 (1907), No. 10, pp. 458–463, fig. 1*).—The results of the author's investigations on the heat of evaporation of water (E. S. R., 19, p. 610) are discussed in comparison with the results of similar work reported by other investigators, and values are given for the heat of evaporation of water from 0 to 200° C.

Additional data on the structure of protein, E. ABDERHALDEN and A. VOITINOVICI (*Ztschr. Physiol. Chem., 52 (1907), No. 3–4, pp. 368–374*).—A study of the amount and character of the cleavage products of protein of animal origin.

Leucin and glutaminic acid were the principle cleavage products from blood fibrin, the amounts obtained being 15.0 and 10.4 per cent, respectively, in ash and water-free material. The amounts of some of the other cleavage products are as follows: Glycocoll 3.0 per cent, alanin 3.6 per cent, valin 1 per cent, prolin 3.6 per cent, aspartic acid 2 per cent, phenylalanin 2.5 per cent, tyrosin 3.5 per cent, and serin 0.8 per cent.

Heat changes in the cleavage of proteids and gelatinoids by ferments, E. GRAFE (*Arch. Hyg., 62 (1907), No. 3, pp. 216–228*).—The calorimetric investigations undertaken under a variety of conditions led to the conclusion that heat is neither liberated nor absorbed during such cleavage.

Hydrolysis of the albumose of meat extract, K. MICKO (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 4, pp. 253–298*).—The principal conclusions drawn from the experiments reported follow: Hydrolysis of that portion of meat extract which could be salted out did not show its identity with gelatin or gelatose, nor was unchanged gelatin identified in meat extract. The salted out portion of meat extract consists of a mixture of different proteids, a nuclein body being present, though the bodies having the general character of albumose are most noticeable. The portion of meat extract which can not be salted out gives monamino acids on hydrolysis, glutaminic acid being most abundant.

A natural isomer of leucin, F. Ehrlich (*Ztschr. Ver. Deut. Zuckerindus., 1907, No. 617, II, pp. 631–654*).—The author reports experimental data regarding the synthesis and constitution of isoleucin, α-amino-methyl-ethyl-propionic acid, first identified in sugarhouse by-products.

The nitrogen of zein in relation to the total nitrogen and the nitrogen of other proteids in maize, M. Soave (*Staz. Sper. Agr. Ital., 40 (1907), No. 3, pp. 193–207*).—The analyses of a number of samples of Italian and American Indian corn showed that on an average the zein nitrogen constituted 32.65 per cent of the total nitrogen and 36.6 per cent of the proteid nitrogen. Zein, according to the author, occurs entirely or almost entirely in the endosperm.

The biochemical function of zein, M. Soave (*Staz. Sper. Agr. Ital., 40 (1907), No. 3, pp. 244–247*).—According to the author, zein passes from the endosperm to the embryo when corn sprouts and there undergoes hydrolytic cleavage, which is induced by an enzym.

Hydrolysis of glycinin from the soy bean, T. B. Osborne and S. H. Clapp (*Amer. Jour. Physiol., 19 (1907), No. 4, pp. 468–474*).—In a total of 54.73 per cent cleavage products on an ash and water-free basis 19.46 per cent was glutaminic acid, 8.45 per cent leucin, 5.12 per cent arginin, 3.78 per cent prolin, 3.86 per cent phenylalanin, and 3.89 per cent aspartic acid. Smaller amounts of other cleavage products are also reported.

Hydrolysis of glycinin from the soy bean, T. B. Osborne and S. H. Clapp **maxima),** T. B. Osborne and S. H. Clapp (*Amer. Jour. Physiol., 19 (1907), No. 4, pp. 475–481*).—On a moisture and ash-free basis glutaminic acid made up 12.35 per cent, arginin 14.44 per cent, and leucin 7.32 per cent of a total of 55.77 per cent cleavage products recovered. Other constituents were found in smaller proportions.

The existence of a tyrosinase in wheat bran, G. Bertrand and W. Muttermilch (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 23, pp. 1285–1288; Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 15, pp. 837–841*).—A tyrosinase was identified in wheat bran and its properties studied.

New oil constants, E. Louise and E. Sauvage (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 3, pp. 183–185, dgm. 1*).—The authors note that when acetone is added to colza and other oils two layers are formed and that a homogeneous mixture may be obtained by heating to a definite temperature. This temperature of miscibility is a constant.

The "nitron" method for the estimation of nitric acid, S. W. Collins (*Analyst, 32 (1907), No. 379, pp. 349–357; abs. in Chem. Zentbl., 1907, II, No. 20, pp. 1710, 1711; Jour. Chem. Soc. [London], 92 (1907), No. 541, II, p. 907*).—The results of tests of Busch's nitron method (E. S. R., 16, p. 945) on a number of different nitrates "show that a considerable degree of accuracy is possible in analyzing materials containing nitrate by this method. The experiments have not been extended to mixtures containing very small quantities of nitrates, except in the case of waters, but there seems no reason why such small quantities can not be accurately estimated, the more so when it is remembered that the weight of 'nitron' nitrate precipitated is nearly seven times that of N_2O_5 present. . . . One of the chief disadvantages attaching to this method is the expense of the reagent." The author therefore worked out methods of recovering and using the base from the precipitates, which he describes.

Estimation of nitric nitrogen, C. M. van Deventer (*Chem. Weekbl., 4 (1907), pp. 594, 595; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 540, II, p. 812*).—The author defends his method against the criticism of Vriens, maintaining that boiling with a strong acid and an excess of ferrous salt can not lead to satisfactory results unless the air is rigidly excluded.

On the digestion of urine in the determination of nitrogen by the Kjeldahl method, P. B. Hawk (*Jour. Amer. Chem. Soc., 29 (1907), No. 11, pp. 1634–1637*).—A comparison of methods. In no case, according to the author, could the urine be satisfactorily digested in less than 30 minutes.

On the determination of the constituents of nitrated mixtures, G. Coffetti and G. Maderna (*Gaz. Chim. Ital., 37 (1907), II, No. 1, pp. 13–17; abs. in Chem. Zentbl., 1907, II, No. 12, p. 1018*).—Methods of determining total acidity, sulphuric acid, and nitrous acid are described. See also a previous note (E. S. R., 19, p. 109).

On the determination of free phosphoric acid in superphosphates, W. Möller (*Chem. Ztg., 31 (1907), No. 72, pp. 879, 880; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 540, II, p. 813*).—The author disagrees with Schultze's statement that no method yet proposed for this purpose gives reliable results, and maintains that the conventional oxalate method, in which 20 gm. of the superphosphate is shaken with 1 liter of water for one-half hour is satisfactory. It is stated that the insoluble phosphates are attacked by the free acid very slowly because of the protective action of the calcium sulphate present.

The accuracy of analysis of fertilizers, H. Bousset (*Rev. Gén. Chim., 10 (1907), p. 309; abs. in Chem. Ztg., 31 (1907), No. 91, Repert. No. 83, p. 562*).—A critical consideration of the errors accompanying sampling, weighing, filtering, washing, titration, and other analytical operations leads to the conclusion that in commercial analysis it is not practicable or necessary to attempt to secure accurate results beyond the first decimal place.

Feeding stuffs and fertilizers, Tacke (*Arch. Deut. Landw. Raths., 31 (1907), pp. 150–237*).—A summary of the work of the German experiment stations on feeding stuff and fertilizer control presented at the general meeting of German agricultural officials in 1907.

Elementary analysis of proteids containing phosphorus, M. Dennstedt (*Ztschr. Physiol. Chem., 52 (1907), No. 1–2, pp. 181–183*).—A critical discussion of methods.

The estimation of starch in potato, L. Pellet and Métillon (*Bul. Assoc. Chim. Sucr. et Distill., 24 (1907), No. 12, pp. 1720–1730, fig. 1*).—A modification of the Baudry method is reported for the determination of starch in potatoes and a method is described for estimating starch for commercial purposes which involves the use of some special laboratory apparatus.

Detection of rice or maize flour in wheat flour and wheat-flour products, G. Gastine (*Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 16–17, pp. 960–965*).—The analytical methods described depend upon the microscopical characteristics of different cereal starches.

The formation of volatile sulphur compounds in meat and their influence on the detection of added sulphites, A. L. Winton and E. M. Bailey (*Jour. Amer. Chem. Soc., 29 (1907), No. 10, pp. 1499–1503*).—The determination of volatile sulphur compounds when meat of different sorts was allowed to decompose showed that although the results were not always uniform the amount of sulphur present as SO_2 during the first 4 days was in most cases inconsiderable and that the amount present as hydrogen sulphid, except in the case of veal, was so small that it could not be determined. "With or without the use of $CuSO_4$ during these days there would have been no danger of declaring sulphites present when none had been added." After the fourth day somewhat larger amounts of sulphur as SO_2 were obtained, but the maximum amount obtained from beef was 1 mg. and from pork 0.8 mg. on the nineteenth day. "These results are especially valuable, since Hamburg steak and sausages are the meat products commonly preserved with sulphites."

The amounts of sulphur as hydrogen sulphid were larger, especially in the case of veal, the maximum being 3.4 mg. on the ninth day. The largest amount of total volatile sulphur, 4.6 mg. on the ninth day of decomposition, was also obtained from veal.

The practical value of determining glycogen as a means of identifying horse meat, A. Kickton and R. Murdfield (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 8, pp. 501-511*).—The possibility of erroneous deductions when starch is present in meat products is pointed out, together with the need for further study before the value of the glycogen test for the quality of such goods can be definitely established.

Experiments on the production of powerful antisera from muscle proteids for use in the identification of flesh of different sorts, W. A. Schmidt (*Biochem. Ztschr., 5 (1907), No. 5-6, pp. 422-437*).—A study of methods for the examination and identification of meat and meat products by means of serums.

The detection of foreign fats in lard, A. Leys (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 3, pp. 199-201*).—The experiments briefly reported have to do with the fusion point of glycerids in relation to the detection of adulteration in lard.

The quantitative estimation of the principal acids occurring in wine and also in alcohol and glycerin, A. Heiduschka and G. Quincke (*Arch. Pharm., 245 (1907), No. 6, pp. 458-461*).—A critical study of methods.

The determination of the specific gravity of milk serum and its value in the judging of cow's milk, N. Schoorl and F. Con (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 10, pp. 637-643*).—From a consideration of the data obtained in the investigation reported, the authors are of the opinion that the specific gravity of milk serum obtained by coagulation with acetic acid according to the method described is of great value in judging milk with regard to dilution by water.

A simple test for casein in milk and its relation to the dairy industry, E. B. Hart (*Wisconsin Sta. Bul. 156, pp. 22, figs. 8*).—Milk from different cows and different herds varies considerably in respect to the ratio of casein to fat. Milk for cheese making should be valued according to its casein content as well as that of fat, and a test for the former to supplement that for the latter is desirable.

The author has devised a test for casein that is practically as simple as the Babcock test for fat, which it somewhat resembles. Two cc. of chloroform and 20 cc. of dilute acetic acid with 5 cc. of the milk are put into a special test flask and thoroughly shaken together, the chloroform to dissolve the fat and the acetic acid to precipitate the casein. The flask is then whirled in a centrifuge to collect the casein in the neck of the flask, which is so graduated that the percentage of casein may be read directly.

The bulletin describes the test in detail, compares results with those by the usual chemical method, and considers conditions which influence the successful operation of the test.

A new areometric method for determining fat, H. Timpe (*Chem. Ztg., 31 (1907), No. 89, pp. 1107, 1108; abs. in Indus. Lait. [Paris], 32 (1907), No. 47, p. 843*).—The principle of the method described is similar to that of Soxhlet's, the chief difference being that sulphuric acid is used in place of potassium hydroxid to dissolve the casein of the milk. Ether is then added to dissolve the fat. Some of the supernatant solution of fat in ether is removed and its specific gravity is determined. The percentage of fat corresponding therewith is found from the table included in the article. The process is relatively rapid and is claimed to be accurate within 0.02 per cent for either whole or skim milk.

On the caprylic acid value of butter fat, R. K. DONS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 5, pp. 333–342; abs. in Chem. Zentbl., 1907, II, No. 17, p. 1452; Analyst, 32 (1907), No. 380, p. 383; Jour. Soc. Chem. Indus., 26 (1907), No. 19, p. 1069*).—The author has modified the method of Jensen (E. S. R., 17, p. 697) for examination of the volatile acids of butter and determines a "first" and a "second caprylic acid value," which are approximately equal in pure butter fat, but the first value is increased much more than the second by the addition of cocoanut oil. Feeding cocoanut cake to cows did not materially affect the normal caprylic acid value of their butter fat.

The baryta value of butter fat, E. AVÉ-LALLEMANT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 5, pp. 317–329; abs. in Chem. Zentbl., 1907, II, No. 17, p. 1453; Analyst, 32 (1907), No. 380, p. 382; Jour. Soc. Chem. Indus., 26 (1907), No. 19, p. 1068*).—By the method described in detail, which is a modification of that of König and Hart, the "insoluble baryta value" and the "soluble baryta value" of the fat are determined. From the examination of a large number of samples of butter fat by this method, the author concludes that pure normal butter fat should have a "soluble baryta value" of 247 to 251, and an "insoluble baryta value" of 60 to 65. The former minus 200 plus the latter should for pure butter fat be negative, but for vegetable fats it is positive. The addition of 10 per cent of lard or beef fat or cocoanut oil raises this value to a positive one. Samples showing a positive difference are to be suspected. The test can not be used on rancid butter or butter that has been strongly heated.

Notes on Avé-Lallemant's baryta value of butter fat, M. FRITZSCHE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 5, pp. 329–333; abs. in Chem. Zentbl., 1907, II, No. 17, p. 1454; Analyst, 32 (1907), No. 380, p. 383; Jour. Soc. Chem. Indus., 26 (1907), No. 19, p. 1069*).—The results obtained by the author in the examination of a large number of animal and vegetable fats confirm the conclusions of Avé-Lallemant regarding the use of this method in the detection of foreign fats in butter.

A creamery method for the determination of water in butter, E. H. FARRINGTON (*Wisconsin Sta. Bul. 154, pp. 19, figs. 4*).—A method of determining the proportion of water in butter by butter makers at creameries that may be used in place of the official method is desirable, as the creameries generally lack the facilities and the butter makers the skill for carrying out the official method. The method described is believed to be suitable for this purpose.

A fairly large sample, about 50 gm. of butter, comprising the total quantity obtained by using a butter trier and removing a core of butter through the entire length of a 60 lb. tub, is dried in a high-pressure oven consisting of a small chamber surrounded by live steam under high pressure. Since the temperature of the steam increases as the pressure is raised the interior of the oven may be kept at a temperature as high as 250° F. or more by simply regulating the pressure of the steam surrounding it. "By employing the boiler pressure ordinarily used in a creamery a temperature of 240 to 280° F. may be easily obtained. This temperature is high enough to dry out all the water in the samples of butter within an hour, or even less, provided pans large enough to spread the butter in a sufficiently thin layer are used." The oven and method of using it are described in detail in the publication.

Results are also given of a study of the factors that influence the water content of butter. "The experiment shows that the moisture content is influenced by the manipulations of the butter when working it and by the temperature of the wash water. Dry butter can be obtained by keeping the cream and the butter cold, by churning to small granules, by washing the butter a very little, and by giving it plenty of time to drain. Butter of a high moisture content can be obtained by churning longer at a higher temperature until the granules are large and by churning the butter in the wash water. Water sticks to soft butter but it is easily pressed out of cold butter."

Analyses of miscellaneous materials, L. L. VAN SLYKE (*New York State Sta. Bul. 293, pp. 335–395*).—Chemical analyses of materials connected with agriculture, made for individual farmers in New York for a number of years, have resulted in an accumulation of a considerable amount of data of this nature. Representative cases which are believed to be of interest are published in this bulletin.

The materials include ashes, dried blood, nitrate of soda, meat meal and tankage, potash salts, muck soils, the fertilizer constituents of miscellaneous materials, constituents of miscellaneous feeding stuffs, molasses refuse, commercial gruels, poultry foods, maple sugar, homemade cider vinegar, and dried apples. In connection with the analytical data, such facts as would add interest to the results of analyses are given so far as information regarding the samples could be obtained.

A new soil sampler, W. H. STEVENSON (*Iowa Sta. Bul. 94, pp. 31, figs. 17*).—The construction and operation of a soil sampler which makes it possible to obtain in a comparatively short time a core of soil 3 in. in diameter and of any desired depth up to 15 in. are described.

"The sampler consists of an outer cylinder of steel, fitted at the lower end with two sets of cutting teeth of tool steel; spiral grooves are milled on the outer side of this cylinder which serve to give increased cleaning capacity to the sampler.

"A steel cylinder, with an inside diameter of a little more than 3 in. and with a guide rod 19 in. in length, fits snugly within the outer cylinder. This inner cylinder does not turn with the cylinder which carries the cutting teeth, but is held rigidly in place . . . A cylinder made of heavy galvanized sand screen with 8 meshes to the inch is placed inside of the inner steel cylinder. . . . As the outer cylinder bores into the soil and separates a core of soil from the soil mass, the inner steel cylinder, carrying the wire cylinder, is carried downward at a rate uniform with that of the outer cylinder and the core of soil is pushed with but little friction and in an unbroken condition into the wire cylinder. When a sample of soil has been secured to the desired depth, the sampler is withdrawn and the wire cylinder, which contains the core of soil, is removed from the machine. When the soil sampler is in operation, it is held rigidly in position by a wooden frame, which is supported on four legs."

The sampler is especially adapted to taking samples of soil for the determination of volume, weight, moisture content, water-holding capacity, permeability to water or air, capillary movement of water, and other physical characteristics. Methods of treating the soil cores (coating with paraffin, etc.) in the laboratory for such determinations as these are described, and the results of a number of these determinations are reported.

The advantages claimed for the apparatus are "the rapidity with which samples can be secured, the unchanged physical condition of the core of soil, and its adaptability for the determination of the physical characteristics of the soil."

New apparatus for determining specific gravity, H. REBENSTORFF (*Sitzber. u. Abhandl. Naturw. Gesell. Isis, Dresden, 1907, Abhandl., pp. 8–17, figs. 3*).—The author describes a displacement apparatus, a floating balance with centigram spindle, and a differential areo-pyknometer, for use in determining the specific gravity of various substances.

Report of progress in agricultural chemistry in 1906, T. Dietrich (*Jahresber. Agr. Chem., 3. ser., 9 (1906), pp. XXXVIII+625*).—This volume reviews as usual, by abstract of the more important articles and by title of those of less importance, the published account of the work of 1906 in the whole field of agricultural chemistry.

Yearbook of chemistry, edited by R. Meyer (*Jahrbuch der Chemie. Brunswick, 1907, pp. XII+637*).—The more important contributions to pure and applied chemistry during the year 1906 are reviewed.

The chemistry of commerce, R. K. Duncan (*New York and London, 1907, pp. XIII+263, pls. 32*).—This is an "attempt to interpret into simple terms and for educated lay-folk some new science in its relation to modern industry," the object being to impress upon practical men the applicability of science to industry. The portions of the book dealing with subjects of special agricultural interest are the chapters on nitrogen fixation and industrial alcohol.

METEOROLOGY—WATER.

The origin and the purpose of the Mount Weather Observatory, W. L. Moore (*U. S. Dept. Agr., Bul. Mount Weather Observ., 1 (1908), pt. 1, pp. 7-11*).—This is a brief general statement by the Chief of the Weather Bureau, introducing the first number of a proposed series of quarterly bulletins reporting the results of the scientific work of the observatory.

The methods and apparatus used in obtaining upper-air observations at Mount Weather, Va., W. R. Blair (*U. S. Dept. Agr., Bul. Mount Weather Observ., 1 (1908), pt. 1, pp. 12-57, pls. 9, figs. 3, charts 3*).—The methods and apparatus are described and illustrated, with tabulated records of a series of kite flights during June to September, 1907, and upper-air isotherms drawn from the observations.

The use of upper-air data in weather forecasting, A. J. Henry (*U. S. Dept. Agr., Bul. Mount Weather Observ., 1 (1908), pt. 1, pp. 58-63, charts 3*).—This article discusses the bearing of observations at different elevations of pressure, temperature, humidity, and wind movement on the development and movement of weather changes, making special application of observations with kites at Mount Weather Observatory during the summer of 1907.

Monthly Weather Review (*Mo. Weather Rev., 35 (1907), Nos. 9, pp. 389-436, figs. 15, charts 6; 10, pp. 437-502, figs. 11, charts 7*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of September and October, 1907, recent papers bearing on meteorology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 9.—Atmospheric Currents at very Great Altitudes (illus.), by C. C. Trowbridge; Spectral Forms in Mist and Rain; Studies of Frost and Ice Crystals, by W. A. Bentley; International Meteorology; The Spectrum of the Aurora Borealis (illus.), by W. M. Watts; Smithsonian Meteorological Tables; Kite Flying from Mountain Tops, and Colliery Explosions and Barometric Pressure.

No. 10.—Highest Kite Flight at Mount Weather, Va.; Interconversion of Centigrade and Fahrenheit Scales, by F. K. Ferguson; Studies of Frost and Ice Crystals, by W. A. Bentley; Meteorological Stations in Southern Nigeria (illus.), by C. F. Talman; The Royal Meteorological Society; The Christmas Meteor of 1873 at Washington, D. C., by H. A. Peck; A Persistent Meteor Train Observed at Albany, N. Y. (illus.), by H. A. Peck; Note on the Diurnal Heat Exchange in a Layer of Snow on the Ground, by T. Okada; A Biographical Sketch of Prof. Diro Kitao, by S. T. Tamura; Biographic Note on H. C. Russell; An Important Method in Aerial Research; A Proposal that Pilot Balloons be More Generally Used in Making Meteorological Observations, by A. de Quervain; Biographic Note on Herman Declercq Stearns, by G. A. Clark; The Lagging of Temperature Changes at Great Heights Behind Those at the Earth's Surface and Types of Pressure Changes at Different Levels (illus.), by H. H. Clayton; Our Present Knowledge Regarding the Heat of Evaporation of Water (illus.), by A. W. Smith (see p. 704); Interesting Old Meteorological Literature; Fire at Mount Weather, Va.; Ice Columns in Gravelly Soil, and Studies on the Vortices in the Atmosphere of the Earth (illus.), by F. H. Bigelow.

Meteorology [of the Transvaal], edited by L. V. PRAAGH (*The Transvaal and Its Mines. London and Johannesburg, 1906, pp. 90–93, figs. 6*).—The characteristic features of the meteorology of the Transvaal are presented in summary tables and brief descriptive notes. On account of the absence of marine influence the climate of the Transvaal is very dry and the proportion of sunshine large.

The country consists topographically of a series of three plateaux, the low veld, ranging from 600 to 1,500 ft., with a tropical and subtropical climate; the middle veld, which is fairly well wooded, ranging from 1,500 to 4,000 ft., and the high veld, a treeless rolling plain exceeding in elevation 4,000 ft.

As a result of these variations in altitude there is an extreme variation in temperature. The mean annual temperature ranges from 57 to 70° F., the mean monthly temperature from 50 to 70°, the mean summer temperature from 69.5 to 72.5°, and the mean winter temperature from 53.6 to 64°. The temperature variation for the low veld is greater than for the other plateaux. The absolute maximum temperature recorded for the low veld during 1904–5 was 108° F., for the middle veld 96 to 104°, and for the high veld 84 to 92°, with the minimum for the low veld 33°, for the middle veld 22 to 37°, and for the high veld 18 to 23°. The mean annual temperature was for the low veld 74.9°, for the middle veld 64.8 to 67.5°, and for the high veld 55.6 to 60.9°.

As regards rainfall, the seasons are divided into wet and dry, the wet season beginning with October and ending with March. Sudden and violent thunderstorms are of frequent occurrence near the beginning and end of the rainy season. The winter season (May to the middle of September) corresponds substantially with the dry season, and is the most pleasant portion of the year. The mean annual rainfall at 24 stations during 1903–4 was 32.16 in., ranging from 23.37 to 53.61 in. The mean for 14 years at Pretoria was 26.31 in. During 1904–5 the annual rainfall at 7 stations varied from 13.69 to 29.85 in., the average being 21.18 in.

As would be expected evaporation is high, being approximately three times the rainfall. Snow occasionally falls on the high veld, and during summer (October to March) violent and destructive hailstorms frequently occur. The prevailing wind direction is NNW. A south wind usually brings rain, but thunderstorms come on a northwest wind. Heavy dust storms not infrequently occur in many parts of the country during winter. The atmospheric pressure is remarkably uniform, the maximum yearly range being about ½ in.

Work of the meteorological station during 1906, G. LÜSTNER (*Ber. K. Lehranst. Wein. Obst u. Gartenbau, Geisenheim, 1906, pp. 279–286*).—Observations on atmospheric pressure, temperature, rainfall, cloudiness, humidity, direction and force of wind, sunshine, etc., at the meteorological observatory of the Royal School for Wine, Fruit, and Garden Culture at Geisenheim are summarized. Notes on phenological observations during the year are also briefly reported.

British rainfall, 1906, H. R. MILL (*London, 1907, pp. 100 + 280, pls. 5, figs. 12; rev. in Nature [London], 76 (1907), No. 1980, p. 587*).—This report is as usual compiled from observations by a large number (4,267) of voluntary observers in different parts of the British Isles (E. S. R., 18, p. 423). The data are discussed with reference to distribution of the rainfall in time and space, and the relation of the total rainfall of the year to the average of previous years is pointed out. Special articles on wind influence on rain gages, by L. C. W. Bonacina, and on the Christmas snowstorm of 1906, as well as records of evaporation and percolation are also included.

The article on wind influence on rain gage measurements traces briefly the historical development of knowledge on the subject, discussing also the probable modus operandi of the causes of these effects and indicates the methods that have been suggested or adopted for removing such effects as a source of error in rainfall records. A bibliography of 45 references to literature of the subject is given.

The average evaporation recorded at 11 stations during 1906 was 18.07 in. The average rainfall for the year as compiled from records of 172 selected stations well distributed over the British Isles was 34.23 in. for England and Wales, 48.69 in. for Scotland, 37.85 in. for Ireland, and 38.71 in. for the British Isles as a whole, approximating very closely the average for 30 years, 1870 to 1899. A deficiency of 1 per cent in England and Wales and 6 per cent in Ireland was compensated for by an excess of 8 per cent in Scotland.

The records of 73 selected stations showed an average of 210 rain days for the British Isles as a whole, 192 in England and Wales, 226 in Scotland, and 231 in Ireland. The number of rain days was considerable in excess of the average of previous years, although, as shown above, the rainfall agreed closely with the average. The records of the same 73 selected stations showed 53 absolute droughts—that is, periods of more than 14 consecutive days—no one of which was a rain day, and 29 partial droughts—that is, more than 28 consecutive days the mean rainfall of which did not exceed 0.01 in. "In 1906 absolute droughts were somewhat more prevalent than on the average of 18 years, while partial droughts were less prevalent to nearly the same degree. . . . There were three periods of absolute drought. The first, beginning at various dates from March 18 to 28, and ending between April 3 and 18, affected 22 stations, mainly in England and Wales, but also in Scotland and the southwest of Ireland. The last fortnight of March and the first fortnight of April were in fact very dry in all parts of the British Isles. The second period of absolute drought was between June 1 and 19, but it affected only 5 out of the 73 stations, all except two—one in North Wales and one in the north of Ireland—being in the west of Scotland. The third and most important absolute drought occurred in August and September, and was reported from 23 stations scattered pretty well over the whole of the British Isles."

The records of the same stations also show during 1906, 91 rain spells—that is, periods of more than 14 consecutive days, every one of which was a rain day.

The distribution of the rainfall of the British Isles is shown graphically in diagrams and in shaded and colored charts.

York rainfall records and their possible indication of relation to solar cycles, J. E. Clark (*Rpt. Brit. Assoc. Adv. Sci., 1906, pp. 500–502; abs. in Symons's Met. Mag., 42 (1907), No. 494, pp. 32, 33*).—A study of data from rainfall records for 89 years at York in comparison with Wolf and Wolfer's sunspot values show a close agreement between the sunspot and the rainfall curves. Similar results were obtained from a study of long-period rainfall records at other places in Great Britain.

Some barometric and rainfall changes of an oscillatory nature, W. J. S. Lockyer (*Rpt. Brit. Assoc. Adv. Sci., 1906, pp. 501, 502*).—The paper of which this is an abstract calls attention to the see-saw nature of the barometric changes and the accompanying rainfall fluctuations at opposite sides of the earth. See also a previous note (E. S. R., 18, p. 711).

On the radioactivity of atmospheric precipitation (*Himmel u. Erde, 19 (1907), No. 12, p. 575*).—This is a brief note on observations by G. Costanzo and C. Negro in Bologna on the radioactivity of snow and rain under different conditions. They found that the snow and rain were always radioactive at the time of precipitation, but that the radioactivity disappeared very quickly (within 2 hours) after precipitation. Precipitation accompanying storms was decidedly more radioactive than ordinary precipitation.

Factors which modify the climate of Victoria, A. W. McCurdy (*Nat. Geogr. Mag., 18 (1907), No. 5, pp. 345–348, figs. 2*).—The climate of Victoria is stated to be characterized by a mild winter, warm summer days and cool summer nights, and a minimum precipitation. The principal factors determining the climate are insular position; very uniform temperature of the Pacific Ocean to the west; prevailing westerly winds, with free access; high mountain ranges which are situated at such distance that but little of the precipitation caused by them extends to Victoria; the Olympic Mountains, withdrawing the moisture from the south winds before they reach Victoria and rendering them cool and dry; and small precipitation throughout a large portion of the year, permitting abundant sunshine.

Natural conditions of Uruguay, A. Backhaus and J. V. Diaz (*Rev. Secc. Agron. Univ. Montevideo, 1907, No. 1, pp. 87–94*).—The climatic and soil conditions of this country are briefly summarized.

The climate of Ceylon, W. H. de Silva (*Brit. Med. Jour., 1907, No. 2445, pp. 1338–1340*).—The climatic conditions of Ceylon are briefly summarized. The mean annual temperature of the island is 76.3° F., the highest recorded temperature for the last 35 years 103.7°, and the lowest 28.2°. The climate varies considerably in different parts of the island as regards both temperature and rainfall, being influenced chiefly by the elevation and by the southwest and northeast monsoons. The average annual rainfall for a large number of years has been 72.86 in.

Climate of different parts of the world, M. Buijsman (*Cultura, 19 (1907), Nos. 225, pp. 340–342; 228–229, pp. 594–601; 231, pp. 769–780*).—This is a contribution to the climate of Cochin-China as indicated by the growth of different species of plants. See also a previous note (E. S. R., 19, p. 115).

Chemical, micrographical, and bacteriological studies of the mineral waters of Cuba, J. A. Fernandez Benitez (*An. Acad. Cien. Habana, 44 (1907), June, pp. 64–72; July–Aug., pp. 181–196; Sept., pp. 297–336, pls. 9; Oct., pp. 369–397, pls. 6; Nov., pp. 451–475, pl. 1*).—Methods employed and the results obtained in the examination of a large number of samples of water from different provinces of Cuba are reported in detail. A classification of the waters on the basis of the results obtained is given.

The microflora of the Prague water supply, F. Ruttner (*Arch. Naturw. Landesdurchf. Bohmen, 13 (1906), No. 4, pp. 47, figs. 8*).—The methods used and results obtained in a detailed study of the water supply of Prague and its relation to the sources from which it is derived are reported.

Water supplies and water powers [of north-central Wisconsin], S. Weidman (*Wis. Geol. and Nat. Hist. Survey Bul. 16, 1907, Sci. Ser. 4, pp. 663–672, pl. 1*).—A study of this subject in connection with a geological survey of north-central Wisconsin showed that the numerous streams of the area afford abundant supplies of water for stock and that there is an abundant supply of soft underground water for domestic purposes in all of the geological formations.

A partially completed survey of the water power of the area shows this to be a prominent and valuable natural resource.

Water supply and sewerage (*Ann. Rpt. Bd. Health Mass., 38 (1906), pp. 69–349, pls. 10*).—The subjects discussed in this report are as usual advice given to cities, towns, public institutions, and individuals regarding water and ice supply, examination of public water supplies and rivers, water-supply statistics, and experiments on the purification of sewage and water at the Lawrence Experiment Station in 1906, including purification of sewage, water filtration, and the significance of the numbers of bacteria in water and sewage developing at different temperatures (E. S. R., 18, p. 212).

Contribution on the rôle of the septic tank in the biological purification of sewage, S. K. DZERSZGOWSKI (*Arch. Sci. Biol.* [*St. Petersb.*], *13 (1907), No. 1, pp. 25–68, figs. 3*).—From a somewhat detailed study of this subject at the sewage purification station at Tsarskoye-Selo near St. Petersburg, the author concludes that the principal function of the septic tank is to remove the suspended organic and mineral matter, or that, in other words, the septic tank acts primarily as a sedimentation basin. While the biological processes bring about changes which reduce the volume of this sediment and facilitate the processes of purification, the rate of disintegration and solution is so slow that only a small fraction of the daily product is so destroyed. As an independent agent of purification the septic tank is considered of little value, a positive disadvantage as a preparation of sewage for further treatment on contact beds and filters, and useless for large purification plants provided with mechanical apparatus for removing suspended matter.

SOILS—FERTILIZERS.

The soils of Tennessee, their chemical composition and fertilizer requirements, C. A. MOOERS (*Tennessee Sta. Bul. 78, pp. 47–90, map 1*).—Chemical analyses of 113 samples of typical soils from different parts of the State which have been made since the publication of a former bulletin on soils (E. S. R., 10, p. 26) are reported, with discussion of general characteristics, classification, and fertilizer requirements as indicated by analysis and fertilizer experiments.

The samples were as a rule of two distinct classes "(1) virgin soils, either from the forest or from newly cleared land, and (2) old lands, which, like the majority of those under cultivation in the State, had not been modified by previous manuring or fertilizing." The methods of analysis were essentially those of the Association of Official Agricultural Chemists, potash, however, being determined by Moore's direct method (E. S. R., 10, p. 408) and clay removed from the ammonia extract in the determination of humus by settling and repeated evaporation and resolution.

A general survey of the State shows that "in passing from the eastern to the western limits of the State marked variations both in the soils and in the farming conditions are readily noticeable. In east Tennessee sharp contrasts occur. The prevailing soils range in color from light gray to dark red, and in texture from sandy loam to clay loam. Many of the valleys have the appearance of being fertile and well farmed; others are poor and abandoned. Some of the hill lands are highly productive, and that others are of the opposite character is evident at a glance. On the Cumberland Plateau is found a large area which, although supporting a fair forest growth, has little durability under farm cropping. On descending from the plateau there are found extending around the central basin of middle Tennessee, and forming the outer part of the highland rim, fertile, red-colored soils of limestone origin. Next to them, and forming the inside of the rim, are the poor gray and yellow-colored soils of the barrens. A marked change again takes place, however, when the rim has been crossed and the rich limestone area of the central basin is entered. On every hand are indications of greatly increased soil fertility. . . . In west Tennessee . . . the soils are by nature fairly fertile and durable, and are remarkable for the great variety of crops which they produce to advantage, but have suffered much from one-sided cropping and from erosion. On the western boundary, along the Mississippi River, are alluvial soils of almost unsurpassed fertility.

"It is especially noteworthy that throughout the State each change in soil type coincides to a marked extent with a change in the rock or other geological formation from which the soil originated."

It is stated that "practically all of the upland soils of this State are of residual origin—formed where they lie, as the result of the decomposition of the rock or other material similar to that which underlies them." Each formation has given rise to soils of fairly well-defined physical characteristics, such as color and texture and similarity of mineral constituents. Investigation of the fertile and durable soils of the State apparently shows "little uniformity in physical composition, that is, there are both rich and poor loams, silt loams, clay loams, etc. In fact, there is only one apparent feature in which the soils of similar productiveness under continued cropping closely resemble each other, and that is their contents of the mineral elements of plant food, phosphoric acid in particular." In other words, Tennessee soils have "originated from different formations, which were very unequally supplied with the mineral plant-food elements, and the resulting soils have the same characteristics."

The principal soil formations dealt with in the case of the east Tennessee soils are Knox dolomite, shale, Chickamauga limestone, miscellaneous marbles and limestones, Tellico sandstone, and alluvial. The soils of west Tennessee are mainly "derived from geological deposits which were not consolidated into rock."

Complete analyses of the "insoluble" residues from ordinary analyses of 12 soils "show that the hydrochloric acid digestion removed in each case most of the phosphoric acid, lime, and magnesia, but that large amounts of potash were unacted upon." Examinations of a number of samples indicate that soil acidity is general throughout the State.

General recommendations regarding the best methods of cropping and fertilizing to increase and maintain the fertility of the soils are given with fertilizer formulas for special crops and a discussion of the advantages of utilizing the geological origin as a basis of classification of Tennessee soils. In the author's opinion geological origin affords "decidedly the best means of grouping these soils with regard both to physical and to chemical composition. . . . To base the classification on texture and structure alone would be to ignore the exceedingly important factor of plant-food supply, on which would depend not only the use of fertilizers, but also to a great extent adaptability to kind of farming."

More light on the origin of the Missouri River loess, J. E. Todd (*Proc. Iowa Acad. Sci., 13 (1906), pp. 187-194*).—As a result of recent investigations of a loess-like deposit of Lake Dakota the author concludes that while the mass of the Missouri River loess will continue to be credited to aqueous forces a very considerable portion will be found to be the work of wind. "The pinnacles along the eastern verge of the trough of the Missouri in Iowa, including possibly Council Bluffs in part, and the higher ridges south of the Missouri in northern Nebraska, also in less degree south of the Platte, the extensive blanket covering the broad divides, especially those between larger streams, may be placed under this head."

Agricultural geology, E. H. L. Schwarz (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 8, pp. 933-945*).—This is an argument in favor of a revival of the geological survey in Natal and explains at some length the relation of geological formations and conditions to the physical, chemical, and biological character of the soil, water supply and drainage, and similar matters of agricultural importance.

Soils in relation to fertility, I. Cameron (*Rhodesian Agr. Jour., 4 (1907), No. 5, pp. 433–444*).—This is a brief general description of the arable soils of Rhodesia and a discussion of their formation, composition, and adaptations. Mechanical and chemical analyses are given of samples of a typical soil of the region.

On potash and phosphoric acid in cultivated soils of Java, T. Marr (*Meded. Proefstat. Oost-Java, 4. ser., 1907, No. 35, pp. 297–355, pls. 2*).—The results of a detailed study of the total and available potash (soluble in calcium chlorid and 2 per cent citric acid) and phosphoric acid (soluble in nitric, hydrochloric, and 2 per cent citric acids) in a large number of Javan soils are reported in detail in this article.

Experiments on the availability of phosphates and potash in soils, J. W. Leather (*Mem. Dept. Agr. India, Chem. Ser., 1 (1907), No. 4, pp. 43–57, pls. 4*).—Determinations of available phosphoric acid and potash by the Dyer method and pot tests with cereals during two years with 8 soils from different parts of India are reported, the author concluding from the results obtained that "there can not be any doubt that the [Dyer] method is proving generally useful for ordinary agricultural land, enjoying a rotation of crops, one of which is usually a cereal, and that the limiting figure proposed by Dyer is much more generally applicable than might have been expected." Dyer's limiting figures are 0.01 per cent of potash and phosphoric acid soluble in 1 per cent citric acid, i. e., soils containing less than this amount need phosphoric acid and potash.

Investigations on the moisture content of soils, W. Schneidewind et al. (*Landw. Jahrb., 36 (1907), No. 4, pp. 582–585*).—Determinations of moisture to a depth of 25 cm. during the dry year 1905 and the wet year 1906, in fallow, fertilized, and unfertilized rotation plats, and green manure plats, are reported. The soil water varied widely in the two years. The highest water content was found in fallow. The water supply of the soil was exhausted to the greatest extent by oats. Fertilizers by increasing the growth increased the draft on the water supply of the soil, and green manure crops made a large draft on soil moisture.

Note on the movement of moisture in soils, W. J. Humphreys (*Science, n. ser., 26 (1907), No. 667, pp. 480, 481*).—This is a brief note calling attention to the important rôle which changes in surface tension due to changes in temperature play in the movement of soil moisture. The fact that the surface tension of the soil moisture increases as its temperature is lowered accounts for the more rapid movement of moisture toward the surface of the soil during the night than during the day.

"Whenever the temperature falls very greatly the corresponding large increase in the tension and in the condensation at the cold surface will take much moisture from the warmer soil beneath. It is largely, if not wholly, this that leads to wet soils so often seen on cold mornings when there has been no rain, and to the surprising depth of mud that frequently follows a thaw. It accounts, too, for the considerable supply of moisture from the deeper soil in the production of ice columns—spewing of the ground.

"This temperature effect on surface tension, on condensation, and on evaporation also greatly conserves that moisture already in the earth and keeps it in motion. That is, the moisture is brought to the surface in greatest abundance only when the temperature there is low and therefore the rate of evaporation into the air small, and whenever the surface temperature is increased, leading to a higher rate of evaporation into the air, the moisture is drawn away to the colder portions of the soil beneath, where it is protected from the winds by the top layers which it has just left."

The movements of the soluble constituents in fine alluvial soil, A. J. Ewart (*Proc. Roy. Soc. Victoria, n. ser., 20 (1907), No. 1, pp. 38–58*).—The author reports a series of plat experiments on "(1) a leached basalt clay, shallow, overlying a very tough clay subsoil, and (2) deep sand of alluvial nature, overlying white sandy subsoil, with some clay," in which the effect of air-slaked and quicklime, gypsum, superphosphate, bone, nitrate of soda, sulphate of ammonia, and blood manure on the growth of rye and oats and on the availability of the soil constituents on manured and unmanured soils was studied. The main results of the experiments were as follows:

On unmanured soil the sodium nitrate appeared to lower the percentage of dissolved matter during the eight months following its application. The slaked lime lowered the amount at first, but by the end of the year it was up to the normal level again. In all other cases the amount of water-soluble matter increased at first, but fell below the unmanured level by the end of the year, except in the case of the gypsum, in which it remained high in spite of a heavy loss, and of the blood manure, in which it did not fall below the amount in the unmanured plat.

The distribution of water-soluble and acid-soluble matter in the soils (1 kg. extracted with 2 liters each of water and decinormal hydrochloric acid) at different dates is shown in the following table:

Matter soluble in water and in dilute acid per kilogram of soil.

	May 18.		September 25.		December 20.	
	In water.	In dilute acid.	In water.	In dilute acid	In water	In dilute acid
	Grams.	*Grams*	*Grams.*	*Grams*	*Grams.*	*Grams.*
Surface	0.61	4.82	0.39	4.69	0.43	4.56
8 inches	.49	4.88	.48	4.52	.45	4.04
16 inches	.46	4.69	.47	4.41	.49	3.76

"In regard to the distribution of the soluble matter in the different layers, the downward movement, as the result of continuous rain, and the less marked upward ascent during drought, were well shown by the unmanured, slaked lime, gypsum, nitrate of soda, bone dust, and superphosphate plats, while the downward movement was merely lessened in summer, and not actually reversed in the case of the quicklime, ammonium sulphate, star phosphate, and blood manure plats. The averages for the water-soluble matter in all the plats are remarkably consistent with the conclusions mentioned, the surface showing a fall and rise, 8 in. depth a slow fall, and the 16 in. an almost similar rise by the end of the year. . . .

"The amount of matter soluble in dilute acid underwent a secondary rise at the end of the year in the superficial layers in the case of the unmanured, sodium nitrate, ammonium sulphate, bone dust, and slaked lime plats, but in all other cases decreased steadily in the surface layers of soil. The quicklime plat was exceptional in showing not only a rise in the superficial layer in September, but also an increase in the average for the whole 16 in., followed by a pronounced fall in December. As regards the averages, these decreased during the year in all the plats excepting the unmanured and slaked lime plats, but the increases in these were very slight in amount. . . .

"The average acid-soluble matter decreases steadily on the surface and more rapidly in the deeper layers, especially during the summer months. . . .

"It will further be noticed that the apparent loss from all the plats excepting the slaked lime and unmanured ones (where there is a slight gain) is very much greater than can be explained by the ash removed by the crop. To what extent these apparent losses are real ones, and to what extent they are due to decreases in solubility, to increases in absorptive power, or to changes in distribution, must be reserved for further investigation. As far as they go they seem to show that the fine alluvial, sandy river-flat soils widely cultivated in many parts of Victoria appear to be peculiarly liable to exhaustion under the action of all chemical manures excepting slaked lime."

Relations between the properties of soils and the assimilation of food by plants, J. KÖNIG, E. COPPENRATH, and J. HASENBÄUMER (*Landw. Vers. Stat., 66 (1907), No. 6, pp. 401-461, fig. 1; abs. in Chem. Zentbl., 1907, II, No. 9, p. 725; Chem. Ztg., 31 (1907), No. 58, Repert. No. 53, p. 350; Jour. Chem. Soc. [London], 92 (1907), No. 538, II, pp. 647, 648*).—In continuation of previous investigations of similar character (E. S. R., 17, pp. 121, 1138) the authors report chemical and physical studies of 6 typical soils (sand, loamy sand, loam, calcareous, clay, and shale) to determine if possible in this way the relation between the physical and chemical properties of the soils and their content of plant food as measured by treatment with various solvents (strong sulphuric acid, hydrofluoric acid, 10 per cent hydrochloric acid, dilute organic acids, ammonium citrate, 6 per cent ammonia, water under pressure, and water charged with carbon dioxid), and shown by their productiveness as tested in experiments with oats, rye, peas, and potatoes grown on the soils in pots and large boxes.

The 6 soils varied widely in plant-food content and in physical properties, but although the amount of plant food dissolved by the different solvents was very variable the relative solubility was, contrary to previous results with other soils, much the same for individual solvents and soils. For determination of easily soluble potash, lime, and magnesia, therefore, one may use with equal safety weak solutions of either citric acid, ammonium citrate, ammonium chlorid, acetic acid, and carbonated water. Ten per cent ammonium chlorid is too strong, a 1 per cent solution being sufficiently strong. Two per cent solutions of citric acid and ammonium citrate are each considered well suited to determination of available phosphoric acid, but the first is preferred.

The plant food, especially the potash, dissolved by treatment of the soil with steam under a pressure of 5 atmospheres is considered to approximate more closely that taken up by plants than the amount dissolved by mineral solvents.

A new property of soils which is described is the power of withdrawing oxygen from hydrogen peroxid. This power is attributed in the first place to enzym action, since the reaction is known to occur with enzyms and the catalytic power is destroyed by treatment with substances known to be poisonous to enzyms. Accompanying this action of enzyms, however, is the colloidal action of manganese and iron oxids, etc. The influence of these oxids in withdrawing oxygen from hydrogen peroxid is only temporarily checked by hydrocyanic acid.

In all of the 6 soils except a clay soil rich in manganese oxid the catalytic action stood in almost direct relation to the humus content.

The growth of plants and the consequent assimilation of plant food from the soil appeared to depend not only upon the amount of soluble plant food present, but also upon the moisture and the depth of the food-supplying soil layer to the extent that the crop yield as well as the absorption of plant food uniformly increases with the water content of the soil up to 60 per cent of the water-holding capacity of the soil and with the depth of the soil layer up to 30 cm.

Large applications of water-soluble fertilizer salts as well as harmful salts retard plant growth.

A definite relation between physical properties of soils and plant growth has not yet been worked out in these experiments. The soils have not been sufficiently long under uniform treatment for this purpose.

The effect of nitrate of soda on the properties of soils, KRUGER (*Bl. Zuckerrubenbau, 14 (1907), No. 17, pp. 265-270*).—The injurious effect of nitrate of soda and other sodium salts on the physical properties of soils is attributed to the formation of sodium carbonate in the soil. It is recommended that as far as possible such salts be used only on crops which do not split up the salts, leaving the sodium residue in the soil, but take up both the sodium and the acid radicle. The crops which do this most completely include most of the cereals and beets. On the other hand mustard, potatoes, and oats split up the sodium compounds and leave the larger part of the soda in the soil.

The utilization of raw phosphate in connection with green manuring, S. DE GRAZIA (*Staz. Sper. Agr. Ital., 40 (1907), No. 1, pp. 54-66; abs. in Chem. Zentbl., 1907, II, No. 12, p. 1011*).—Experiments are reported from which the conclusion is drawn that green manuring with leguminous and cruciferous plants increases the availability of the phosphoric acid of the soil and of insoluble phosphates applied to the soil, the strongly acid root juices rendering the phosphates soluble. The literature of this subject is reviewed.

The phosphoric acid requirements of red clover in relation to the assimilation of this substance, and clover sickness of soils, K. K. GEDROIZ (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 1, pp. 39-65; abs. in Centbl. Bakt. [etc.], 2. Abt., 19 (1907), No. 10-12, p. 343*).—The experiments reported by the author show that both clover and flax in their earliest periods of development require large amounts of soluble phosphoric acid. Oats and to a greater extent mustard showed smaller requirements for soluble phosphoric acid in the soil, although their content of phosphoric acid was greater than that of clover and flax. The conclusion is reached that clover sickness is probably due more frequently to a deficiency of soluble phosphoric acid in the soil than to a lack of potash, which is usually assigned as the cause of this condition, although the author does not deny that a deficiency of potash may sometimes be the cause of clover sickness.

Studies on humus formation, III, S. SUZUKI (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 4, pp. 513-529*).—This is an account of a continuation of studies on this subject (E. S. R., 19, p. 419), the results of the series of studies being summarized as follows:

"These investigations show that the nitrogen in the humus is not present as amino compounds, but chiefly as a kind of protein which may be connected more or less intimately with the black substances. In my former communication the observation was mentioned that not only starch but also proteins are blackened by the humification process. This, however, does not exclude that some of the protein is derived from soil bacteria, while another part from the decaying roots. It seems that during the humification process certain atomic groups in the protein molecule are considerably changed or also oxidized away and this becomes thus less suited as food for bacteria and mold fungi.

"According to this result, the writer is inclined to believe that Udransky's artificial nitrogenous humic acid[a] would naturally differ from that of the natural one, because the protein-like substance or several kinds of amino acids would not be formed when a mixture of glucose and urea is treated with boiling hydrochloric acid.

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[a] Ztschr. Physiol. Chem., 12 (1888), p. 42.

"It was further shown that of amino acids as such only traces are present, and that such compounds are only obtainable after treating with hot concentrated hydrochloric acid; 500 gm. of dry humic acid yielded the following decomposition products: Alanin 2.39 gm., leucin 2.16, alanin+aminovalerianic acid 0.11, aminovalerianic acid 0.57, copper salt of active prolin 0.67, copper salt of inactive prolin 0.5, aspartic acid 0.06, impure aspartic acid 2.16, glutamic acid present, tyrosin trace, histidin trace, ammonia 1.9, copper salts of unknown acids 30.3. Of course, these quantities show the minimum amount of the yield, as a part of these substances are lost during the purification process."

Nitragin, O. MOLINA and C. MACIAS (*Agricultor [Yucatan], 1 (1907), No. 10, pp. 150-153*).—This article contains the instructions of the commission of agricultural parasitology of Mexico regarding the use of this material, with a view to testing it on a large scale by farmers.

Cereals and bacteria, W. B. BOTTOMLEY (*Country Life [London], 22 (1907), No. 560, p. 466, fig. 1*).—This is a brief announcement of the isolation of nitrogen-fixing bacteria which increase the yield of barley, wheat, and oats when distributed in the soil on which these crops are grown.

Purpose and plan of an experimental field for bacteriological investigations, W. KRÜGER (*Landw. Jahrb., 36 (1907), No. 3, pp. 371-382*).—A system of experiments for this purpose as outlined for use in cooperative work by the German Agricultural Society is briefly described.

Soil fertility, M. WHITNEY, trans. by H. FABRE (*Ann. École Nat. Agr. Montpellier, n. ser., 7 (1907), No. 2, pp. 89-130*).—A translation of Farmers' Bulletin 257 of this Department (E. S. R., 18, p. 119).

The maintenance of fertility (*Ohio Sta. Bul. 183, pp. 195-228, figs. 4, dgms. 2*).—The experiments reported in this bulletin began in 1897 and have included laboratory, stable, and field investigations with manure from a large number of growing and fattening steers, dairy cows, and sheep.

The report deals with the amount and composition of manure produced by different animals under varying conditions, the deterioration and preservation of the manure, and its effectiveness as shown in field experiments with various crops.

In the experiments steers fed on a cemented floor produced 38.9 lbs. of excrement, exclusive of bedding (which averaged about 7 lbs. additional), per 1,000 lbs. live weight per day. Three-fourths of the nitrogen and phosphorus and seven-eighths of the potassium given in the feed and bedding were recovered in the manure thus produced. The quantity of manure produced by dairy cows was considerably larger than that from fattening steers. Lambs fed under shelter on an earth floor, on which the manure was permitted to accumulate, produced 29.86 lbs. of excrement, exclusive of bedding (which averaged 3.29 lbs. additional), per day and per 1,000 lbs. of live weight. About two-thirds of the nitrogen, four-fifths or more of the phosphorus, and nine-tenths of the potassium contained in the feed and bedding were recovered in the manure from lambs thus fed.

"When manure was exposed for 3 months in an open barnyard during the winter and early spring it lost nearly one-third of its total fertilizing value, as shown by chemical analysis. When such manure was compared with fresh manure in field experiments the ton of yard manure produced increase to the value of $2.15, as a 10-year average, while the ton of fresh manure gave an average increase of $2.96 for the same period, showing a loss in effectiveness of 81 cts. per ton, or 27 per cent.

"When either fresh or yard manure was reenforced with gypsum or kainit its effectiveness was decidedly increased, but when floats or acid phosphate was used the gain was very much greater, so much so as to make it relatively unprofitable to use gypsum or kainit.

"The net gain from the use of acid phosphate as a nature reenforcement has been greater than that from floats, and the ton of fresh manure, reenforced with 40 lbs. of acid phosphate, has produced a 10-year average increase to the value of $4.57 over and above the cost of treatment, or more than double the increase produced by the ton of untreated yard manure.

"When manure has been compared with other fertilizing materials on the basis of chemical elements contained the results justify the assumption that the nitrogen, phosphorus, and potassium of farm manure may be expected to produce effects equal to those produced by the same elements in such fertilizing materials as tankage, bone meal, and muriate of potash, when the two classes of elements are used in equal quantities and in the same relative proportions."

The loss of fertilizing value in dung (*Mark Lane Express, 97* (*1907*), *No. 3967, p. 424*).—Analyses reported by T. B. Wood are quoted showing that manure of cattle fed roots, hay, and oil cakes contained 0.57 per cent of nitrogen, 35 per cent of which was in ammoniacal form, as against 0.32 per cent (9 per cent ammoniacal) in manure of animals receiving only roots and hay. Thus, while the former is much richer than the latter, it is subject to much larger loss of nitrogen. See previous note (E. S. R., 19, p. 218).

Fertilizer experiments, W. Schneidewind et al. (*Landw. Jahrb., 36* (*1907*), *No. 4, pp. 586-608*).—The results obtained in 1906 with barnyard manure confirmed those of previous years in showing that deep stall manure is much more effective than that from heaps. The loss of nitrogen in the heap was greatly reduced by spreading the fresh manure on a layer of old manure. Gypsum was ineffective and is condemned as a preservative. The best results were obtained by preserving the urine from the stalls by itself and rotting the manure and litter with water.

Green manuring with beans and peas gave good results in comparison with manure on beets and oats. With potatoes the results were very variable. The success of green manures depends more largely upon the rainfall during the period of growth than upon the character of the soil. Experiments with yellow clover and serradella seeded between the rows of grain indicate this to be a bad practice when the green manure crops develop sufficiently to affect injuriously the growth of the grain.

In comparative tests of nitrate of soda, sulphate of ammonia, and lime nitrogen on humus and heavy loess loams and on a sandy soil with barley, potatoes, and sugar beets it was found that in cases in which the nitrogenous fertilizers caused a large increase in yield the nitrate of soda gave the highest returns, ammonium sulphate next, and lime nitrogen the smallest. When the increases in yield were small the effect of the fertilizers was very nearly the same, the less active material giving a slightly greater increase than the nitrate. The best results were obtained with the less active fertilizers in the case of potatoes. The results further indicate that it is a mistake to apply these fertilizers on sandy soils in the fall. Much better results, however, may be obtained by fall application on the better class of soils.

In a comparison of black fallow with peas in 5 and 6 year rotations the financial return from the rotation containing peas was decidedly greater than from that containing black fallow.

Hiltner's Nitragin and American nitro-culture were compared on horse beans, peas, alfalfa, and serradella, with the result that neither in field experiments nor in pot experiments did the American nitro-culture show any effect. The Nitragin was quite effective on horse beans, but of little or no benefit to other crops.

Issleib's process of soaking seeds for 48 hours in a solution containing 50 gm. each of ammonium nitrate, potassium nitrate, ammonium phosphate, and sodium phosphate per liter of water was tested with negative results.

Chilean nitrate combine, A. A. WINSLOW (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 3008, p. 10*). Statistics are given of the output of the nitrate mines of Chile. The export during 1906 is given as 1,766,805 metric tons, valued at $79,320,710. The export to the United States is constantly increasing and was about 25 per cent of the total output in 1906. "England consumes nearly one-half the output, Germany coming next."

When wheat fails, S. P. THOMPSON (*World's Work* [*London*], *10* (*1907*), *No. 59, pp. 493-498, figs. 4*).—This article discusses the importance of the development of methods for the artificial production of nitrate in order to insure the continuance of an adequate supply of wheat.

It is stated that the territory at present available for wheat production, 240,000,000 acres, is capable with the present average yield per acre, 12½ bu., of producing enough wheat for only 666,000,000 people, assuming the average annual consumption per head to be 4½ bu. At the present rate of increase the population of wheat-eating inhabitants of the world will reach this number in 1910. With better methods of culture and more liberal use of fertilizers it should be possible to increase the average yield from 12½ to 20 bu. per acre, but it is estimated that to do this would require 166 lbs. of nitrate of soda per acre, which, for the area now under wheat, 175,000,000 acres, would require 12,000,000 tons of nitrate per annum.

The article describes the Notodden works in Norway, which are prepared to utilize 22,000 horsepower in the manufacture of basic lime nitrate. This power is obtained at the unusually low cost of 0.5 ct. per kilowatt hour. With power at this price the Norwegian product can be made at a cost of half that of nitrate of soda laid down at Hamburg.

Food and science (*Country Life* [*London*], *22* (*1907*), *No. 561, p. 470*).—This is an editorial discussion of the article noted above.

The industrial fixation and utilization of atmospheric nitrogen (*Ciel et Terre, 28* (*1907*), *No. 1, pp. 10-17*). A brief review of the history of the development of processes for this purpose, especially that of Birkeland and Eyde.

On the analytical determination of nitrogen oxids and the quantitative relations in combustion of nitrogen in the high tension flame, W. NIIRANEN (*Dissertation, Karlsruhe, 1907, pp. 38, figs. 6*).—A study of the laws and conditions controlling the oxidation of nitrogen in the high tension flame is reported.

Validity of the law of mass action for the combustion of nitrogen in the high-tension flame arc, A. GRAU and F. RUSS (*Ztschr. Elektrochem., 13* (*1907*), *No. 34, pp. 573-578, figs. 2; abs. in Sci. Abs., Sect. A—Phys., 10* (*1907*), *No. 119, pp. 644, 645, fig. 1*).—The authors give a preliminary account of recent experiments in order to correct a misunderstanding of their work by Le Blanc. The account deals with the equilibrium of NO concentration, the validity of the law of mass action, and the temperature of the high-tension flame. The results of their experiments are platted in a series of curves which show (1) that the equilibrium point of NO concentration of the escaping gas is independent of the energy consumption in the electric arc, (2) that the law of mass action is valid for combustion of nitrogen in such arcs, and (3) that the temperature attained must be about 3,500° C.

On the absorption of nitrogen by calcium carbid, F. E. POLZENIUS (*Chem. Ztg., 31* (*1907*), *No. 77, pp. 958, 959; abs. in Chem. Zentbl., 1907, II, No. 20, pp. 1681, 1682; Jour. Chem. Soc.* [*London*], *92* (*1907*), *No. 541, II, p. 867; Chem.*

Abs., *2* (*1908*), *No. 1, p. 160; Bul. Soc. Chim. France, 4. ser., 4* (*1908*), *No. 1, p. 55*).—The relative advantages of various added materials as means of increasing the absorption of nitrogen by the carbid are briefly discussed.

Absorption was found to be greatly accelerated by oxygen-free calcium compounds of low fusion points and by compounds of other metals which form with the calcium of the carbid compounds of low fusion point. "With 10 per cent of calcium chlorid the absorption of nitrogen by calcium carbid is easily recognizable at 500°, at 700° it is quite intense, and at 800° it is violent."

On lime nitrogen, II, G. Bredig, W. Fraenkel, and E. Wilke (*Ztschr. Elektrochem.*, *13* (*1907*), *No. 36, pp. 605–612; abs. in Sci. Abs., Sect. A—Phys.*, *10* (*1907*), *No. 119, p. 645*).—In continuation of previous investigations (E. S. R., 19, p. 124) the authors studied in some detail the catalytic action of various materials on the fixation of nitrogen by calcium carbid.

Among substances experimented with were lithium, sodium, potassium, beryllium, magnesium, calcium, strontium, barium, and aluminium chlorids; calcium fluorid; lime; magnesia; sodium hydroxid; calcium, sodium, and magnesium sulphates; tricalcium phosphate, and sodium carbonate, singly and combined. The chlorids were most effective, efficiency decreasing with increasing atomic weights of the elements.

The conclusion is drawn that of the various hypotheses advanced to explain the beneficial action of adding various substances, the solution theory alone is supported by the results obtained in these experiments. The results, however, do not substantiate the view that the relative action of the added materials is determined by their melting points. The whole mixture must be considered as well as the solubility of the carbid in the mixture. The rate of fixation under otherwise similar conditions was dependent in these experiments upon the pressure of the nitrogen gas.

On fertilizer experiments with lime nitrogen, nitrogen lime, and lime niter, Steglich (*Abs. in Ztschr. Angew. Chem.*, *20* (*1907*), *No. 39, p. 1686*).—This is a brief note on a paper read at the seventy-ninth meeting of German Naturalists and Physicians at Dresden, reporting pot and field experiments with these three materials in comparison with nitrate of soda and sulphate of ammonia.

The pot experiments gave inconclusive results. In the field experiments lime niter stood next to nitrate of soda in effectiveness, but lime nitrogen and nitrogen lime were superior to ammonium sulphate if applied 8 to 14 days before seeding. They, however, lose considerable amounts of nitrogen on exposure to the air. An objection to lime niter as compared with nitrate of soda is its greater hygroscopicity.

Comparative fertilizer tests of lime nitrogen, nitrogen lime, and other nitrogenous fertilizers for oats, lettuce, and kohl-rabi, Otto (*Abs. in Ztschr. Angew. Chem.*, *20* (*1907*), *No. 39, p. 1686*).—A brief note on tests reported in a paper before the seventy-ninth meeting of German Naturalists and Physicians at Dresden, in which the results were in general much the same as those of Steglich noted above. For lettuce and kohl-rabi the nitrogen lime and lime nitrogen were decidedly superior to nitrate of soda.

Fertilizer experiments with nitrogen lime, A. Stutzer (*Illus. Landw. Ztg.*, *27* (*1907*), *No. 78, pp. 681, 682; abs. in Chem. Abs.*, *2* (*1908*), *No. 6, p. 879*).—This is a brief report of experiments on barley and oats under very unfavorable weather conditions during 1907. On the basis of nitrate of soda as 100, the nitrogen lime showed a fertilizing value of 76 on barley grown on dry soils, 85.8 on wet soils, and 81.9 on oats, giving an average under all conditions of 80. The unfavorable seasonal conditions consisted of a late, very short, and dry spring and very rainy summer with little sunshine and high winds.

On the influence of certain lime compounds on the fertilizing value of ammonium sulphate and nitrogen lime, A. Stebutt (*Fühling's Landw. Ztg., 56 (1907), No. 19, pp. 669–676*).—From the pot experiments reported the conclusion is drawn that the calcareous manures ordinarily used in practice, namely, calcium oxid, calcium carbonate, and gypsum, are under normal conditions without influence on the action of ammonium sulphate and nitrogen lime.

Under what conditions can fertilizing with ammonium sulphate be made most effective? Rippert (*Deut. Landw. Presse, 34 (1907), No. 78, p. 621*).—In many cases ammonium sulphate gives best results when used as a top-dressing, if applied some time before seeding. This may be done without fear of loss if the application is made on the snow or when the soil is well supplied with moisture from the previous winter.

Crude ammonia, A Grégoire and J. Hendrick (*Bul. Agr.* [*Brussels*], *23 (1907); No. 8, pp. 592–604; Ann. Gembloux, 17 (1907), No. 10, pp. 578, 579; Engrais, 22 (1907), No. 52, p. 1241; 23 (1908), No. 1, pp. 19, 21*).—Crude ammonia is described as the product obtained in gas houses by saturating Laming's mixture, which consists of ferrous sulphate, or more commonly natural iron oxids, and lime, made porous by addition of sawdust, with the gas, usually after it has been cooled and washed. As would be expected, the product is very variable in composition, depending largely upon the character of the previous washing of the gas. If this has been thorough, little or no ammonia escapes and the product will absorb mainly sulphur compounds, cyanids, and sulphocyanids which escape the washing.

The average of analyses made by the authors shows of ammoniacal nitrogen 0.66 per cent, sulphocyanid nitrogen 0.55 per cent, ferrocyanid nitrogen 1.41 per cent, total nitrogen 4.65 per cent, sulphur 19.82 per cent (of which 12.20 per cent is free), lime 9.47 per cent, and potash 6.47 per cent.

From pot experiments with rape and plat experiments with sugar beets the conclusion is reached that the fertilizing value of the "crude ammonia" has been grossly exaggerated by some investigators, and that it may even be positively poisonous when, as is sometimes the case, considerable amounts of sulphocyanids are present. In the experiments with rape the efficiency of the nitrogen of the crude ammonia was 22 to 40, as compared with nitrate of soda 100. With sugar beets its effect was nil. Its nitrogen is probably rarely as efficient as that of nitrate of soda, and the extremely variable composition of the material makes its action both as a fertilizer and as a destroyer of weeds, insects, and the like uncertain.

Crude ammonia and calcium cyanamid, M. de Molinari and O. Ligot (*Bul. Agr.* [*Brussels*], *23 (1907), No. 9, pp. 666–672, figs. 2*).—Pot experiments with oats and barley are described. The results show that in the loam soils relatively rich in nitrogen experimented with the insoluble nitrogen of the crude ammonia was much less effective than the soluble and total nitrogen. The calcium cyanamid gave a yield but slightly inferior to that of sulphate of ammonia.

Peat: Its use and manufacture, P. R. Björling and F. T. Gissing (*London and Philadelphia, 1907, pp. XII+173, pls. 7, figs. 54; rev. in Nature* [*London*], *76 (1907), No. 1979, pp. 562, 563*).—"This book contains a practical account of the different methods of preparing peat for commercial purposes, and of the uses to which peat can be applied."

Different chapters deal with formation, growth, and distribution; specific gravity and analyses; methods of digging, cutting, and dredging; drying; peat fuel manufacture; nature and uses of peat as a fuel; and uses of peat otherwise than as fuel, including preparation of illuminating gas, paper, textiles, artificial wood, products of destructive distillation (ammonia, acetic acid, naphtha, oils, and paraffin), moss litter, peat molasses feeding stuff, peat mull for deodorizing, packing, and sewage purification purposes, poudrette, peat paraffin candles, charcoal, alcohol, fertilizer, and a number of other minor uses.

Peat and its agricultural uses, G. Paturel (*Prog. Agr. et Vit.* (*Ed. l'Est*), *28* (*1907*), *No. 13*, *pp. 383–389*; *Engrais*, *22* (*1907*), *No. 14*, *pp. 327–331*; *abs. in Chem. Abs.*, *1* (*1907*), *No. 17*, *p. 2284*).—Peat deposits are roughly divided into 3 layers, the upper brown layer consisting of vegetable matter in process of decomposition, the darker colored middle layer further advanced in decomposition, and the black compact lower layer rich in carbon which is used as fuel. Peat is considered as superior to straw as litter, and manure with peat has given better results on wheat and sugar beets than manure with straw. It is valuable for use in composts, and crude phosphates are rendered more available by composting with it. When treated with superheated steam, peat yields most of its nitrogen as ammonia. It may also be made useful in promoting intense nitrification in niter beds. Peat powder is an excellent absorbent for use in preparing molasses feeds (taking up 3 times its weight of molasses). It may also be used as a source of alcohol, as a disinfectant, and as a preservative of animal and vegetable products.

The peat deposits of northern Indiana, A. E. Taylor (*Ind. Dept. Geol. and Nat. Resources Ann. Rpt.*, *31* (*1906*), *pp. 73–290*, *pls. 8*, *figs. 47*).—This article defines peat and muck, and describes different varieties of peat, shows the extent of distribution of peat deposits throughout the world, classifies peat marshes, and discusses the origin and uses of peat.

The results of a detailed study of the occurrence, quality, and uses of peat in northern Indiana, more particularly in the counties of Steuben, Dekalb, Allen, Whitley, Noble, Lagrange, Elkhart, Kosciusko, Wabash, Miami, Fulton, Cass, Marshall, St. Joseph, Laporte, Starke, Pulaski, White, Jasper, Porter, Lake, and Newton, are given. Examinations of 29 samples of Indiana peat show fuel values ranging from 2,523.1 calories per kilogram to 5,814.6 calories. In 5 of these samples the nitrogen varied from 2.22 to 3.91 per cent, the phosphoric acid from 0.96 to 1.9 per cent, and the potash from 0.82 to 1.56 per cent.

Glauconite as a fertilizer, C. Schreiber (*Bul. Agr.* [*Brussels*], *23* (*1907*), *No. 9*, *pp. 656–665*).—Pot experiments with soil rich in glauconite during 2 years are reported. The glauconite grains in the soil contained 0.02 per cent of potash soluble in boiling water, 0.17 per cent soluble in strong hydrochloric acid, 0.73 per cent soluble in strong nitric acid, and 4.29 per cent soluble in hydrofluoric acid.

The results showed in general that soils abundantly supplied with this material contained a considerable reserve of potash which became available for plant growth each year, the extent of assimilation of the potash being controlled by the character of the plant. Such soils therefore required less potash in the form of fertilizers in order to obtain the maximum yield than soils not containing glauconite.

Field experiments on the fertilizing action of the more important potash salts, Wein et al. (*Arb. Deut. Landw. Gesell.*, *1907*, *No. 127*, *pp. 159*; *abs. in Mitt. Deut. Landw. Gesell.*, *22* (*1907*), *No. 33*, *pp. 295–297*).—The results of systematic cooperative experiments, mainly with kainit and 40 per cent potash salt, at 5 experiment stations are reported. The dependence of the effect of the potash salts upon the kind of crop and character of soil, climate, and culture is made evident by the details of the different experiments reported.

Orange River silt as a fertilizing agent, C. F. Juritz (*Agr. Jour. Cape Good Hope*, *31* (*1907*), *No. 3*, *pp. 295–299*).—A chemical analysis of the silt from the bed of Orange River showed organic matter 14.8 per cent, lime 1.44 per cent, potash 0.47 per cent, phosphoric acid 0.22 per cent, and nitrogen 0.1 per cent. Mechanical analysis showed 71.2 per cent of clay and 28.5 per cent of silt. "Rich though it may be, the Orange River deposit contains too much clay, and is therefore too dense and heavy to enable it to be advantageously used in its original condition, but when deposited on the surface of a sandier soil, with which it may be manipulated, it would add considerably to the agricultural value of the latter."

Report of analyses of samples of fertilizers collected by the Commissioner of Agriculture during 1907 (*New York State Sta. Bul. 294, pp. 295–382*).—This bulletin gives the results of analyses by the station of samples of fertilizers collected by the State Commissioner of Agriculture during 1907.

Analyses of commercial fertilizers, W. FREAR ET AL. (*Penn. Dept. Agr. Buls. 149, pp. 79; 153, pp. 59*).—These bulletins give reports on inspection of fertilizers in Pennsylvania during 1906.

Analyses of commercial fertilizers, B. L. HARTWELL, J. F. MORGAN, and L. F. WHIPPLE (*Rhode Island Sta. Bul. 125, pp. 107–122*).—This bulletin is supplementary to Bulletin 122 of the station (E. S. R., 19, p. 322) and reports analyses of fertilizers examined during the last half of 1907, bringing the total number of brands examined during the year up to 106. In something over two-thirds of the cases the percentages of fertilizing constituents found were equal to or above the guaranties.

Fertilizers and feeding stuffs act, 1906 (*Bd. Agr. and Fisheries [London], Leaflet 196, pp. 3*).—This leaflet gives the principal amendments to the act of 1893. They went into effect January, 1907.

AGRICULTURAL BOTANY.

Botany at the British Association (*Nature [London], 76 (1907), No. 1978, pp. 556–559*).—A synopsis is given of the botanical papers presented before the section of the British Association for the Advancement of Science. Among the communications is a note by W. B. Bottomley, in which he described some results of his experiments on the inoculation of nitrogen-fixing bacteria in plants other than the Leguminosæ. He stated that tomatoes had been made to produce a greatly increased crop by this means, the bacteria having been first cultivated for some time in tomato juice. In experiments with wheat the bacteria had been induced to establish themselves in the cortex of the root, although no nodules were formed, as is the case on the roots of Leguminosæ.

The germination of seeds of water plants, W. CROCKER (*Bot. Gaz., 44 (1907), No. 5, pp. 375–380*).—Attention has been called by a number of writers to the peculiarities in the germination of seeds of aquatic plants, some maintaining that seeds would not germinate without being dried, and others that the germination is due to fermentative processes.

The author carried on experiments with seeds of a number of aquatic plants, and had little trouble in securing their germination, providing the seeds had not completely ripened.

In another series of experiments ripe seeds were selected and their seed coats broken with sterilized instruments. When so treated the germination of nearly all the species was prompt and a high percentage was secured, while lots of similar seeds in which the seed coats remained entire failed to give any germination. This experiment seems further to demonstrate the author's previous conclusions (E. S. R., 18, p. 433) that delayed germination or failure to germinate is more generally due to seed coats limiting or excluding water or oxygen supplies than to embryo characters.

Effect of light upon the germination of spores and the gametophyte of ferns, A. C. LIFE (*Mo. Bot. Gard. Ann. Rpt., 18 (1907), pp. 109–122, figs. 2*).—

Experiments were carried on with the spores of a number of ferns to study their germination.

It was found that under ordinary conditions they would not germinate in darkness when sown upon leaf mold. The germination was best in a medium light intensity. The intensity of light was found to affect the forms of prothallia, weak light producing filamentous ones, while strong light produced the normal forms. Weak light was found to inhibit the production of archegonia and favor the production of antheridia.

The action of colored light on plants, C. FLAMMARION (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 11, pp. 1321–1323, fig. 1*).—In previous papers (E. S. R., 16, p. 848) the author has given an account of the effect of different colored lights on the growth of a number of plants, such as sensitive plants, coleus, lettuce, gladiolus, etc., in which the most pronounced growth was made under the red screens. In the present paper he reports upon experiments on the growth of oaks, ferns, and beans. The greatest amount of growth was made under the red screens, followed by blue, white, and green in the order enumerated.

In connection with these investigations the author studied the nitrogen content of beans grown under the different colored lights. The greatest increase in nitrogen was under the uncolored screen, and always where the conditions were least favorable for chlorophyll development.

On the importance of physiologically balanced solutions for plants, W. J. V. OSTERHOUT (*Bot. Gaz., 42 (1906), No. 2, pp. 127–134; 44 (1907), No. 4, pp. 259–272, figs. 7*).—Studies were made of marine, fresh-water, and terrestrial plants grown in dilute solutions of natural and artificial sea water and in solutions of sodium chlorid, magnesium chlorid, magnesium sulphite, potassium chlorid, and calcium chlorid, the compounds used in making up the artificial sea water.

The results obtained are in striking agreement, and tend to show that while each of the salts was poisonous when used alone, when mixed in proper proportions their toxic effects were counterbalanced. The results appear to be in harmony with those of Loeb and others, who have experimented with animals, and serve to emphasize the similarity between plants and animals in some of their fundamental characters.

Frost injuries to sycamore buds, H. VON SCHRENK (*Mo. Bot. Gard. Ann. Rpt., 18 (1907), pp. 81–83, pl. 1*).—A description is given of frost injuries to sycamore buds, which are said to have occurred over a considerable portion of the United States during the past season. The injury has been attributed in some instances to other causes, but from the author's investigations it is apparently due to severe frost occurring after the buds have begun to develop.

Plant anatomy from the standpoint of the development and functions of the tissues and handbook of micro-technic, W. C. STEVENS (*Philadelphia, 1907, pp. XII+349, figs. 136*).—This book attempts to point out in a brief and elementary way how plants have become adapted to the carrying on of their functions through the evolution of the different tissue systems from a primitive, undifferentiated tissue, and how the various tissue systems are adapted to the carrying on of the plant's vegetative functions.

At the close of each chapter there are given illustrative studies for the laboratory, designed to fix in the student's mind the principal features discussed. These exercises are expected to develop the more important features of microtechnic and to give facility in preparing and examining the material. Chapters are given in which are described in considerable detail methods for the preparation of sections, the use of the microscope, reagents and processes, and the microchemistry of plant products. A chapter is devoted to the detection of adulterations in foods and drugs which is designed to give practical suggestions in pure food and drug investigations.

Experiments on the fall and renewal of leaves, C. Flammarion (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 11, pp. 1327, 1328*).—In 1891 the author planted a number of acorns of *Quercus robur* in pots, and the seedlings have since been protected from winter conditions, with the result that the young trees have changed their habit of growth and resemble evergreen species, in that the young leaves now appear before the fall of the old ones.

Mendel's law of dominance in Viola, E. Brainerd (*Rhodora, 9 (1907), No. 107, pp. 211-216, figs. 2*).—Some experiments with violets are described in which, in some particulars at least, Mendel's law of dominance seems to find illustration. The special instance described in these experiments is that relating to inheritance of color of the capsules and seeds of what is believed to be a hybrid between *Viola hirsuta* and *V. papilionacea*.

By applying analytical methods to over 30 putative violet hybrids, the offspring were found to segregate in accordance with Mendelian principles.

The author's work relative to the hybrids of Viola having been questioned, an examination of 18 species of stemless violets was made. From this it was found that all but two of these species produced seed freely from the petaliferous flowers, in some instances over 300 such seeds being produced by a single plant.

The experimental production of plant monstrosities, L. Daniel (*Trav. Sci. Univ. Rennes, 5 (1906), No. 2, pp. 81-98, figs. 10*).—A review of literature is given, together with a study of various teratological forms, made to determine some of the contributing causes that would account for their origin. The factors considered included the effect of overnutrition, pruning, mutilation, and other means of disturbing the equilibrium of plants, as shown by their subsequent development.

On the assimilation and respiration of some grafted plants, L. Daniel (*Trav. Sci. Univ. Rennes, 5 (1906), No. 2, pp. 77, 78*).—On account of the striking variations sometimes noted in the growth of grafted plants when compared with seedlings, the author made a preliminary study of the assimilation and respiration of specimens of Artemisia and Plagius grafted upon Anthemis stock, comparisons being made with check plants. In the case of the Artemisia plants the assimilation of the carbon dioxid and its respiration were less than in the checks, but with the Plagius the grafted plants decomposed more carbon dioxid and liberated more than double the amount of that gas than did the check plants. The experiments are only preliminary and can not be considered as offering general conclusions.

Variations in the composition and comparative resistance of grafted and nongrafted plants, C. Laurent (*Trav. Sci. Univ. Rennes, 5 (1906), [No. 1], pp. 57-65, figs. 2*).—In continuation of earlier work analyses are reported of red and white grape musts from different localities and of white and purple cabbage. Grafting was found to increase the crude fiber and saccharifiable matter in cabbage and to diminish the total ash, increasing some of the ash constituents and diminishing others. With grapes, different samples showed differences in composition as well as in resistance to fungus diseases.

On the variation in composition of certain food plants after grafting, C. Laurent (*Trav. Sci. Univ. Rennes, 5 (1906), [No. 1], pp. 141-147*).—Analyses of stems and leaves of grafted and ungrafted cabbage and of seeds of grafted and ungrafted beans are reported from which the conclusion was drawn that grafting affects the chemical composition according to the functional capacity of the stock. With cabbage the greatest variations noted were in carbohydrates and with beans in ash.

The morphology of the leaves of fruiting and nonfruiting cherry branches, P. SEYOT (*Trav. Sci. Univ. Rennes, 5 (1906), No. 2, pp. 22–33, figs. 9*).—A study was made of the morphology of the leaves of fruit-bearing and nonfruiting shoots on cherry trees. In the external morphology the petioles of the leaves from nonfruiting spurs are short and thick, while the limb of the leaf is rounded at the base and tapers toward the tip. The marginal serrations usually bear two small teeth. The leaf from the fruiting shoots has a longer and more slender petiole, and the limb tapers to the petiole and is rounded toward its summit, while the serrations have only a single secondary serrature.

The different type leaves vary in their minute structure in that the wood tissue of the leaves from nonfruiting spurs is regularly lignified and is radially disposed in the petiole. The liber is less thickened, the palisade parenchyma has longer cells, the intercellular spaces are large and regular, the lower epidermal cells are small and irregular, and the stomata are very numerous on the lower surface. The minute structure of leaves from fruiting shoots shows very irregular structure of the wood, the liber thickened, the cells of the palisade parenchyma short, the intercellular spaces scattered and irregular, the cells of the lower epidermis larger and more irregular, and the stomata less abundant.

Important differences in chemical composition were observed in the study.

Note on the nature and composition of the leaves of the cherry, P. SEYOT (*Trav. Sci. Univ. Rennes, 5 (1906), [No. 1], pp. 138–140*).—Analyses of cherry leaves from fruit-bearing twigs, leaves at the base of these twigs and from non-fruiting twigs showed that they varied in composition, leaves from the base of fruit twigs being intermediate between the other two sorts.

Concerning the albinism of sugar beets, O. FALLADA (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rubenz. Indus. Österr.-Ungar., No. 191, pp. 1–7*).—A description is given of a form of albinism in sugar beet leaves that is characterized not only by the changed color of the leaves but also by important differences in their chemical composition. The albino leaves are said to have a higher water content and a lower proportion of organic materials, especially protein and nitrogen-free extract. They also have a higher content of potash and phosphoric acid, with a corresponding reduction in lime and silica.

FIELD CROPS.

The reseeding of depleted range and native pastures, D. GRIFFITHS (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 117, pp. 27, pls. 3*).—The reseeding of ranges and native pastures is discussed and the results accomplished in this line of work are briefly considered.

The number of native species used for this purpose is comparatively small, the principal ones being Western wheat grass (*Agropyron occidentale*), which has been successfully introduced into meadows on the eastern slope of the Black Hills in South Dakota, bunch grass (*A. spicatum*), successfully used on a small scale upon denuded pastures in eastern Washington, *Elymus triticoides*, which inhabits the low, moist, nonalkaline bottoms of the Great Basin country and also extends into the interior valleys of California, *Poa lucida* growing together with *E. triticoides* in many localities in northeastern Nevada and southeastern Oregon on sagebrush land irrigated by spring flood waters, and giant rye grass (*E. condensatus*), which has been tried by rangers in the Rocky Mountain and Great Basin regions and has the advantage of being very tenacious when thoroughly established and of growing on quite alkaline soil.

Only a few species of cultivated forage plants have been successfully used in the restoration and improvement of native pastures and meadows. Redtop (*Agrostis alba*) and timothy (*Phleum pratense*) are the most important and in many localities, especially in the Rocky Mountain and coast ranges, these grasses have largely replaced the native sedgy and weedy vegetation. Good stands of redtop and timothy had been established in the Kootenai Mountains of Montana as early as 1897 and experiments carried on by this Department in that year in the Big Horn Mountains of Wyoming resulted in producing a decided increase in the yield of pastures at an altitude of 7,000 ft. and in creek bottoms at 4,500 ft. Livestock owners have successfully sown seed of these grasses upon moist meadows around Steins Mountains in eastern Oregon. Throughout the Rocky Mountain region they have become disseminated from feed hauled into the mountains, as well as by systematic effort. Red clover, white clover, and orchard grass have been used successfully in a more limited way in mountain meadows and upon clear woodlands.

The systematic efforts of introducing these legumes and grasses into mountain meadows vary greatly, the seed being either scattered upon the snow, sown in autumn upon comparatively dry land, or sown in the spring upon wet ground as the snow melted. Late fall seeding is considered most generally successful when no cultivation is given. Willow lands in mountain meadows are well adapted to timothy, and this grass is successfully grown with little or no cultivation upon such lands in the Okonogan Valley of Washington. It is stated that care must be exercised in the cultivation of moist mountain meadows as the breaking of the turf may result in destructive erosion. Redtop is more important in many places than timothy, being adapted to moist situations. It is, however, more difficult to establish because the seeds are not so easily covered.

Kentucky-bluegrass (*Poa pratensis*) is spreading very rapidly under the grazing conditions obtaining in the eastern edge of the cattle country. It is apparently working its way into the small draws and ravines of native pastures of western Kansas and Nebraska, and farther east in the brushy regions of Arkansas and Missouri it continues to gain ground among the more aggressive native grasses and brush and has already become so firmly established that over large sections of this region it is now the main pasture grass. It is also found entirely practicable to assist the spread of this grass by seeding it upon uncultivated land.

Alfilerilla, wild oats, the brome grasses, and wall barley (*Hordeum murinum*) are classified as introduced weedy species, which in certain sections have supplanted in a great measure the native vegetation and now furnish a large part of the feed on the uncultivated lands.

Notes are also given on the character of seeding adapted to different regions, the burning and cultivation of native pastures, and weeds occurring in the same.

Investigations on the differences in taking up plant food in the Leguminosæ and the Gramineæ and their probable cause, O. Lemmermann (*Landw. Vers. Stat., 67 (1907), No. 3-4, pp. 208-251*).—This paper discusses the differences in the root systems of these two orders with reference to their structure, their acidity and excretions, and the construction of their transpiratory organs.

The results of the experiments conducted show that the Gramineæ are capable of transpiring larger quantities of water than the Leguminosæ, and that for this reason where the two kinds of plants are grown together the Gramineæ are placed to a better advantage with reference to taking up water from the soil together with the soluble plant food it contains. Several adaptations in the Leguminosæ, however, tend to neutralize this advantage as, for instance, the large leaf surface, the movement of the leaflets, the production of comparatively larger quantities of starch in the leaves, the appropriation of the free nitrogen of the air, and the more extensive root system. They also possess a greater root acidity which enables them to avail themselves of plant food material not readily soluble, which the Gramineæ are either incapable of unlocking for themselves or are able to take up only under great difficulties. Many of the Leguminosæ have the advantage of mycorrhizal symbiosis in addition to bacterial symbiosis. These results are considered as an aid in explaining the variations in the flora of a meadow treated with nitrate of soda or with kainit and Thomas slag.

Report of an experiment on the manuring of rye grass and clover at four centers in the county, 1906, E. PORTER and R. C. GAUT (*County Council Lancaster, Ed. Com., Agr. Dept., Farmer's Bul. 2, pp. 10*).—It was found in these tests that commercial fertilizers can be economically employed on the first year's crop, and that while a complete mixture is not necessary to produce a heavy crop it gives the best herbage and a good yield. Phosphates and potash had the greatest effect in promoting the growth of clover, but the use of nitrogenous manures such as sulphate of ammonium early in the year and unduly forcing the rye grass by heavy applications of nitrate of soda proved injurious to the abundance and strength of the clover. The use per acre of 1 cwt. each of nitrate of soda and muriate of potash and 2 cwt. of superphosphate is recommended for rye grass and clover where clover is fairly abundant.

Investigations on the influence of different depths of planting on the growth of cereals, E. RIGGL (*Vrtljschr. Bayer. Landw. Rat., 12 (1907), No. 2, Sup., pp. 313-378, figs. 11*).—This dissertation reviews the results of the more important work on this subject and reports the author's own investigations.

It was observed that oats differed from other cereals in the location of the crown with reference to the seed and the length of the coleoptile or outer leaf of the plumule above the surface of the soil. In wheat, barley, and rye plants the crown is formed at a comparatively small distance from the planted seed, and the origin of the coleoptile is therefore close to the seed grain, while in the case of oats, millet, and maize the crown is formed at a greater distance above the planted seed than in these other plants, and in consequence the base of the coleoptile is nearer the surface of the soil. In barley and oat plants, the seed of which was planted from 8 to 11 cm. deep, the length of the coleoptile was from 5 to 6 cm. and from 3½ to 4½ cm., respectively. The coleoptile of the oat plants protruded from 1 to 1½ cm. above the ground, while in the case of barley it remained from 2 to 3 cm. below the surface. In general it was observed that germination was slower and more irregular as the seed was planted deeper.

In studying the early development of seedlings above ground of different crops planted 9 and 12 cm. deep, it was observed that rye showed a greater number of individuals that died down than any of the other crops, and that the young plants of Petkus rye seemed hardier than those of Schlanstedt. It was further observed that barley and oats sown 9 cm. deep or less were extremely sensitive to temperatures of from 3 to 4° C. At these temperatures the young leaves showed yellow rings in some cases 1 cm. wide, while at higher temperatures the young portions of the plant as they broke through the ground presented the normal green color. Continued higher temperatures, however, caused the yellow portions of the young plants to assume the normal color. Rye and wheat were not affected in this way on the experiment plats, but it is stated that on moor and sandy soils a reddish-brown color appears, similar to the yellow in barley and oats.

Measurements taken showed that the crown in varieties of rye was from 2.3 to 2.6 cm. below the surface of the ground, in varieties of wheat from 2.9

to 3.4 cm., in varieties of oats from 4.1 to 4.4 cm., and in varieties of barley from 4.6 to 5 cm.

The culture of cereals in Sfax, Tunis, LELOUP (*Les Cultures de Céréales de Sfax en Tunisie* [*1907*], *pp. 10*).—Notes extracted from a series of letters treating of cereal crops in Tunis and published in pamphlet form. The different subjects discussed are the conditions of soil and climate, soil preparation, and the seeding and harvesting of wheat, oats, barley, and forage crops.

The ripening of grains during storage, A. ATTERBERG (*Landw. Vers. Stat.*, *67* (*1907*), *No. 1-2, pp. 129-143*).—Earlier observations by the author along this line indicated that immature grain, although low in moisture content and kept in dry storage, will remain unchanged during the winter but will ripen with the rise of temperature in the spring. The water content may fall below 10 per cent without ripening the grain, but with this degree of dryness it ripens faster than when moist. A high temperature accelerates the ripening process. Grain dried at a high room temperature required usually from 1 to 2 weeks to attain its full germinative power, but it was found that incompletely matured grain may require from 1 to 2 months.

It was often found that in the beginning of the dry process the germinative power declined, and that in tests with immature barley drying at 37° C. gave the best results in the improvement of its germinative capacity. Barley with a germination of 98 per cent soaked in water and then dried at 60 and 70° C. had its percentage of germination much reduced, and a drying temperature of even 50 or 48° proved injurious.

Germination tests by different methods show that immature grain germinates much better at 7 and 10° C. than at higher temperatures, and in general that seed grain germinates better at a low than at a high temperature. A number of tests showed that a difference of only 3° may be sufficient to determine a good or a poor germination. For practical purposes it is recommended that germination tests be made at 13 to 15° C. rather than at 20°. Some seed germinates best at a temperature as low as 10° C., but more time is required than when the temperature is higher. Seed too immature to sprout may be ripened by drying at 40° for 6 to 8 days and will then germinate satisfactorily even at 20° C.

The systematic classification and nomenclature of grain varieties for practical purposes, VON RÜMKER (*Fühling's Landw. Ztg.*, *56* (*1907*), *No. 16, pp. 545-566*).—The advantages of systematically classifying and naming the grain varieties are pointed out in this article, and outlines of classifications and descriptions for the different cereal crops are given.

Meadow culture in its agricultural and technical aspects, F. W. DÜNKELBERG (*Der Wiesenbau in seinen landwirthschaftlichen und technischen Grundzügen. Braunschweig, 1907, pp. XXI+374, pls. 4, figs. 165*).—Part 1 of this book deals with meadow culture in general, discussing the different grasses, various kinds of soils, and the treatment of meadows, special attention being given to irrigated grass lands. Part 2 is devoted to the technical side of the question and discusses such points as the location, slope, grading, drainage, and irrigation of meadows. The method of draining meadows by means of open ditches and tile drains is outlined and subirrigation is discussed. Directions are also given for the use of the transit and its application in land improvement work.

Hesselvig irrigation farm, T. C. WESTH ET AL. (*Viborg, Denmark, 1907, pp. 24*).—A description of the development of this farm from largely unproductive heather to valuable irrigated meadows. These meadows are treated with compost, together with 50 to 100 lbs. of 37 per cent potash salt and 100 to 150 lbs. of Thomas slag per töndeland (1.36 acres).

Hardwood timber lands, D. A. WALLACE (*St. Paul, 1907, pp. 46, figs. 35*).—This book discusses the peculiarities and the characteristics of the cut-over timber lands in northeastern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan, and points out in a popular manner the agricultural possibilities of these regions.

Forage crops, E. B. VOORHEES (*New York and London, 1907, pp. XIII + 384, figs. 63*).—Brief and practical suggestions are given for the growing and using of forage crops, with special attention to soiling crops and to rotations furnishing a continuous supply of forage throughout the growing season. The different subjects discussed are forage crops for hay, for land improvement, and for soiling, permanent meadows and pastures, straw cereals and green forage grasses, millets and teosinte, Kafir and Durra corns, sweet sorghum, maize, leguminous forage crops, crop mixtures, alfalfa, the clovers, root crops, the cabbage tribe, and Bermuda and brome grass.

The concluding chapter of the book presents in tables the average composition of feeding stuffs, the fertilizer ingredients of fodders and feeds, and the coefficients of digestibility of feed stuffs.

Practical farming, S. W. ALLERTON (*[Chicago], 1907, pp. 124, pl. 1*).—This book consists of short notes on numerous and varied farm topics, including the culture and uses of all the common cereal and forage crops.

Cyclopedia of American agriculture. Crops, L. H. BAILEY ET AL. (*New York, 1907, vol. 2, pp. XVI + 699, pls. 25, figs. 907*).—The first volume of this work has been noted (E. S. R., 18, p. 1088).

In this second volume part 1, comprising 7 chapters, is devoted to the plant and its relations, including its structure and physiology, insects and diseases, plant breeding, plant introduction, crop management, weeds, growing plants under cover, and seeding, planting and yields. Part 2 treats of the manufacture of crop products, one chapter discussing preserved products and a second chapter juices and liquors, and part 3, which constitutes about five-sevenths of the entire volume, consists of special articles on the culture and uses of North American field crops. These articles are contributed by specialists in the various lines of work.

Report of coast land experiments, J. M. JENKINS (*South Carolina Sta. Bul. 133, pp. 10*).—This bulletin tabulates without comment the yields of different field and forage crops obtained at the Clemson College coast land experiment station in 1906.

Peruvian alfalfa: A new long-season variety for the Southwest, C. J. BRAND (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 118, pp. 35, pls. 3, figs. 12*).—The seed of a Peruvian strain of alfalfa was presented to this Department by a firm in Chile, and a study of the resulting crops has led to the conclusion that the strain is sufficiently different from all other alfalfas to constitute a distinct botanical variety. It was found that this variety grows more rapidly, makes quicker recovery after cutting, begins growth earlier in spring, and continues growth later in autumn than common alfalfa. This results in one or two additional cuttings each year, and also in a greater yield from each cutting due to its vigorous growth. The zero point of this strain or the mean temperature above which growth begins in spring and below which it ceases in autumn was found to be unusually low.

The results of these investigations are considered as appearing to substantiate the view that cultivated alfalfa is not one homogeneous species, but is composed of numerous strains, varieties, or even subspecies. A technical description is given of the new variety and the conditions under which it originated are discussed. The name proposed for it is *Medicago sativa* var. *polia*.

It has been found that Peruvian alfalfa can be grown to greatest advantage only under irrigation and in the Southwest where the climate is mild in winter. The low zero point of growth has the advantage of making growth possible during an unusually long season, but on the other hand it is responsible for the presence of tender tissue when cold weather comes, which necessarily lowers its winter resistance.

Alfalfa, "the grass" in Ohio, A. O. Myers (*Columbus, Ohio, 1907, pp. 187, pls. 15*).—This is a popular book on the culture, uses, and value of alfalfa in Ohio, devoted largely to giving the author's personal experiences with this crop.

Barley crops of the United States, 1866–1906, C. C. Clark (*U. S. Dept. Agr., Bur. Statis. Bul. 59, pp. 36*).—This bulletin contains in tabular form the acreage, production, and value of barley in the United States by States and by years from 1866 to 1906, inclusive.

The culture and uses of brome grass, R. A. Oakley (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 111, pt. 5, pp. 15, pls. 3*).—This bulletin contains brief discussions on methods of culture and the uses and value of brome grass, including notes on growing the species with other grasses and clovers, on the seed production of this grass, and on its use in crop rotations and the preparation of brome grass sod for succeeding crops.

Harvesting and storing corn, C. P. Hartley (*U. S. Dept. Agr., Farmers' Bul. 313, pp. 32, figs. 17*).—The different methods of harvesting corn, including the making of corn silage, cutting and shocking, husking from the standing stalks, and jerking and storing the ears unhusked are discussed. The use of corn-picking machines and of huskers and shredders is noted, and the storing of the stover and the ears is considered.

Corn crops of the United States, 1866–1906, C. C. Clark (*U. S. Dept. Agr., Bur. Statis. Bul. 56, pp. 37*).—Tables are given in this bulletin, showing the average acreage, production, and value of corn in the United States by States and by years for the period 1866–1906.

The cotton plant: Its development and structure and the evolution and structure of the cotton fiber, A. Flatters (*London and Manchester, 1906, pp. 92, pls. 31*).

The Indian cottons, G. A. Gammie (*Calcutta: Govt., 1905, pp. 38, pls. 9, maps 2*).—This publication gives a general description of the cultivated cottons of India, classifies them into groups and species, and presents an outline of their distribution, together with a list of the varieties of cotton tested at Poona. The following species of cotton are represented in India: *Gossypium obtusifolium, G. arboreum, G. sanguineum, G. herbaceum, G. intermedium, G. indicum, G. neglectum, G. cernuum,* and *G. hirsutum.*

Cotton in western French Africa, Y. Henry (*Le Coton dans l'Afrique Occidentale Francaise. Paris, 1906, pp. 346, figs. 64, maps 5*).—This book describes cotton culture and the cotton industry in Senegambia, Sudan, and Dahomey, and devotes several chapters to the ginning and baling of cotton and to scientific experiments in the culture and selection of the plant.

Oat crops of the United States, 1866–1906, C. C. Clark (*U. S. Dept. Agr., Bur. Statis. Bul. 58, pp. 35*).—This bulletin presents in tables the acreage, production, and value of oats in the United States by States and by years from 1866 to 1906, inclusive.

Potato culture, H. Werner (*Kartoffelbau. Berlin, 1906, pp. 231, figs. 16*).—This book appears as one in the series of agricultural works known as the Thaer Bibliothek. The different subjects discussed are species and varieties, biological characteristics, diseases, insect enemies, climatic and soil requirements, and the culture, storing, and uses of the crop.

Report of experiments upon the potato crop, 1905-6, E. PORTER and R. C. GAUT (*County Council Lancaster, Ed. Com., Agr. Dept., Farmer's Bul. 3, pp. 28*).—This is a report on experiments with potatoes conducted at the county-council farm and on various farms during the two years.

Planting sprouted tubers resulted in larger crops and a greater production of tubers of large size than when unsprouted tubers were planted. Seed potatoes from the south of England did not give so good results as northern-grown seed, and seed from localities within the county was not so productive as that introduced from a more northern latitude. The yield from Irish-grown seed sprouted was below that from Scottish-grown seed sprouted.

The use of 20 tons of barnyard manure per acre was slightly more profitable than the use of 10 tons when the price was not more than 96 cts. per ton. A light dressing of barnyard manure with a suitable application of commercial fertilizers was more profitable than the use of barnyard manure alone. The results also indicated that large and profitable crops of potatoes can be grown with the use of a complete mixture of commercial fertilizers. When barnyard manure is to be used in conjunction with commercial fertilizers the following application per acre is recommended: Barnyard manure 10 tons, sulphate of ammonia 1½ cwt., superphosphate 4 cwt., and muriate of potash 1½ cwt. On land well stored with humus, or on soils which have been liberally treated with barnyard manure in previous years, the use per acre of 2½ cwt. of sulphate of ammonium, 6 cwt. superphosphate, and 2¼ cwt. of muriate of potash is considered adequate for satisfactory crops.

Cooperative variety and fertilizer tests with potatoes. 1906, M. WEIBULL, J. NATHORST, and L. FORSBERG (*Malmö. Lans. K. Hushåll, Sallsk. Kvrtlsskr., 1907, No. 1, pp. 143-195*).—A report is given of the third year's work with potatoes conducted on 20 different farms with 15 factory and 8 table varieties.

The use of commercial fertilizers showed an apparent increase of 21 per cent in the yield of tubers and 11 per cent in the yield of starch over the check plats. In another series the increase was 19.6 and 11.9 per cent, respectively, as compared with an increase of 10.7 per cent in the yield of tubers and 11.4 per cent in the yield of starch on plats receiving barnyard manure. Where barnyard manure and commercial fertilizers were applied together the yield of tubers was increased by 14.5 per cent and the yield of starch by 0.03 per cent. The check plats produced 26,380 kg. of potatoes and 5,060 kg. of starch per hectare (about 11.74 tons of potatoes and 2.25 tons of starch per acre).

Potato variety tests, 1906, H. J. DANNFELT (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 2-3, pp. 179-200*).—Tests were conducted on 18 farms in 7 different counties in Sweden.

The best results from varieties grown for industrial purposes were secured with Silesia, which produced 5,570 kg. of starch, and from Industrie, which gave 31,120 kg. of tubers per hectare (about 2.48 and 13.85 tons per acre). Among the table varieties Up-to-Date ranked first in yields of both tubers and starch, producing 31,600 and 4,803 kg., respectively. Of the sorts grown for factory purposes, Fürst Bismarck and Brocken contained 20.3 per cent of starch, and Opal 19.8 per cent.

Notes on seed potatoes, F. PARISOT (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 10, pp. 1173-1175*).—The author describes two kinds of seed tubers, one of which after winter storage is firm to the touch, has large eyes and short solid sprouts of several millimeters in diameter, and the other which is soft with the surface roughened or shriveled and dried, with small eyes and fine slender sprouts. The first kind he names normal and the second abnormal seed potatoes. The results of experiments which he presents show that the abnormal tubers produce only about 40 per cent of the yield of the normal tubers.

The effect of defoliating sugar beets, K. Andrlík and J. Urban (*Ztschr. Zuckerindus. Bohmen, 31 (1907), No. 11, pp. 709-761*).—A study of the development of the sugar beet in its normal form and with part of its leaves removed is reported. The rainfall from April 10 to October 3 was 375.3 mm. (about 14.8 in.), but its distribution was such that droughty conditions prevailed from the latter part of June until August.

Samples of 25 to 30 normally grown beets for analysis and observation were taken June 21, July 5 and 31, August 21, and October 3. The weight of the root in these beets increased irregularly, the smallest increase taking place in August, and a much more marked development in September and October. The leaf weight reached its maximum early in July, then declined during the dry weather until August 31, and increased again in September. The dry matter and sugar content in the beet increased until the end of July, when both began to decline. The percentage of total nitrogen, which at first declined, increased during the dry weather, but at the close of the vegetative period a decrease in nitrogen had again taken place. The composition of the ash on the different dates of sampling is given in the following table:

Average composition of ash in the sugar beet on different dates during the growing period.

Substance.	The root.					The leaves.				
	June 21.	July 5.	July 31.	Aug. 21.	Oct. 3.	June 21.	July 5.	July 31.	Aug. 21.	Oct. 3.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
K_2O	45.58	43.22	38.49	36.49	35.59	25.38	25.20	25.75	21 84	20.71
Na_2O	19.10	15.58	10.64	7.98	6.04	36.01	34.40	31.84	23.64	17.71
CaO	3.52	6.22	10.10	13.21	17.60	10.44	12.21	12.34	16.80	16.46
MgO	5.06	7.57	11.28	12.20	13.01	6.42	4.62	6.09	7.90	7.23
P_2O_5	15.92	17.66	19.68	18.54	17.00	6.62	5.91	3.59	3.56	4.63
SO_3	5.00	5.12	5.11	5.17	7.44	5.10	6.58	8.30	9.88	9.20

The undesirable nitrogen compounds and the potash in the beet decreased from June 21 to October 3, which was equivalent to an improvement in the quality. It was further found that the maximum sugar content at the end of July was not accompanied by the highest coefficient of purity.

The weight of the dry matter increased regularly up to the end of July, but from this time on to August 21 there was only a moderate increase until the rains in September again accelerated growth. The increase in the weight of the dry matter of the leaves during August was reduced by 21.6 per cent, owing to the drying of the foliage, and the later renewal of growth did not make up this loss. The average yield of dry matter per plant at harvesting was 121 gm., of which the root furnished 74 per cent. The insufficient rainfall during the summer retarded to a marked degree the formation of sugar and dry matter, and also reduced the quantity of nitrogen taken up by the plant, this being due largely to the withering of the foliage. The ash presented variations similar to those of the nitrogen, and the fluctuations of each individual constituent are shown and discussed.

In studying the effect of defoliation 70 per cent of the leaves was removed from the plants on one plat July 5, 94 per cent on a second plat July 31, and 19 per cent on a third plat August 21. The removal of 70 per cent of the leaves reduced the yield of roots by 36 per cent, the yield of sugar by 35 per cent, and the yield of dry matter by 34 per cent. The sugar content was only

0.25 per cent lower than in the beets grown normally. Defoliation retarded the formation of dry matter and decreased the consumption of plant food, while it but slightly affected the quality of the beet.

The more nearly complete defoliation on July 31 reduced the yields of beets, leaves, and sugar 24 per cent, 23 per cent, and 30.5 per cent, respectively. The sugar showed a reduction of 1.1 per cent as compared with that of plants from which no leaves had been taken. When harvested the defoliated plants contained 30 per cent less nitrogen, 28 per cent less potash, and 18 per cent less phosphoric acid than the check plants.

Removing 19 per cent of the foliage on August 21 decreased the yield of beets by 13 per cent, increased the yield of leaves by 3 per cent, and decreased the yield of sugar by 13 per cent. The sugar content remained unchanged.

The results of another series of experiments showed that the removal of from 50 to 94 per cent of the leaves reduced the yield of roots from 10 to 26 per cent and diminished the sugar content from 0.5 to 2.7 per cent. When only from 20 to 25 per cent of the leaves were taken off the yield of beets was lowered by from 1 to 14.4 per cent, while the reduction in sugar content was unimportant. It was observed, however, that in case the leaf growth was very luxuriant even moderately defoliating the plants proved injurious in this regard.

Experiments with varieties of sugar cane, J. P. D'ALBUQUERQUE and J. R. BOVELL (*Rpt. Agr. Work Barbados, Imp. Dept. Agr. West Indies, 1904–1906, pt. 3, pp. 91*).—Experiments with seedling and other varieties of canes were made on different estates and the results secured are tabulated in detail and are also briefly discussed.

On black soils the best results as plant canes were given by D.95, yielding 9,216 lbs. sucrose per acre, as compared with 6,876 lbs. for White Transparent. This difference in yield of sucrose represents an increased value of $24.34 per acre. D.95 was followed by B.1529, B.147, D.1438, B.376, and B.208 in the order named. As plants and rattoons on red soils B.1566 gave a yield representing a gain of $47.30 over White Transparent. Good results on the red soils were also obtained from B.376, D.95, B.208, and B.1529.

Annual report on sugar manufacture, J. BOCK (*Jahresber. Zuckerfabrik. [Stammer], 46 (1906), pp. XI + 351, figs. 32*).—This report is a compilation of the results of agricultural investigations on the sugar beet and of technical experiments in the manufacture of sugar. The results of chemical research work are given in abstract form. The report also contains a list of patents in relation to the beet sugar industry, and gives statistics on beet culture and sugar production in different countries, together with legislation affecting the production and commerce of sugar.

Correlation in different varieties of Vicia faba, K. ORPHAL (*Landw. Vers. Stat., 67 (1907), No. 5–6, pp. 331–406; abs. in Fühling's Landw. Ztg., 57 (1908), No. 1, pp. 29–36*).—The varieties studied were the German marsh bean and the Dutch marsh bean representing *Vicia faba major*, and the small Halberstadt, Eckendorf, and Kirsche field beans representing *V. faba minor*.

The observations and measurements showed that in all varieties the correlation between the weight of the plant and the weight of the grain was complete, between the weight of the plant and the weight of the pods and the number of grains was very evident, and between the weight of the plant and the thickness of the stem and the number of the pods was quite apparent. The length of the internodes was but little influenced by the length of the stem.

In addition to determinations of the correlation, it was observed that the water requirements of *V. faba* during the growing period are in general very high. In the first half of the growing period the Dutch marsh bean withdrew the greatest and the Kirsche field bean the smallest quantity of water from the soil. From the time of blossoming to maturity the German marsh bean required the largest and the Dutch marsh bean the smallest amount of water. For the entire period of growth the Kirsche field bean required the least and the German marsh bean the most water.

In each of the two seasons that this work was carried on the marsh beans came into blossom a few days earlier than the field beans. The progress of blossoming was in every variety from the lower portion of the stem toward the upper portion. The period of growth of the Dutch marsh bean was shorter than that of any other variety. The largest number of branching individuals was observed in the Dutch marsh bean and the smallest number in the small field bean. It is stated that for grain production individuals with little tendency to branch are preferable.

Researches in and the formation of new varieties of wheat by means of hybridization, N. STRAMPELLI (*Alla Ricerca e Creazione di Nuove Varieta di Frumenti a Mezzo dell'Ibridazione. Rome: R. Staz. Sper. Granicolt. Rieti, 1907, pp. 24, pls. 17, figs. 5*).—The author describes his method of carrying on wheat improvement work by means of hybridization and gives lists of hybrids obtained by him in the years 1900, 1904, 1905, 1906, and 1907. The dominant and recessive characters observed by the author in this work are also listed.

Studies of the nitrogen content of wheat and its distribution to different parts of an individual plant, R. W. THATCHER and H. R. WATKINS (*Jour. Amer. Chem. Soc., 29 (1907), No. 9, pp. 1342-1351*).—The data reported regarding the composition of the grain from different parts of a single head show "that the best grains from the standpoint of weight of kernel, and nitrogen content, came from the outer grains of the spikelets in the middle of the spike. Whether these properties are capable of transmission to the succeeding generations can be determined only by experimental trial."

Wheat crops of the United States, 1866–1906, C. C. CLARK (*U. S. Dept. Agr., Bur. Statis. Bul. 57, pp. 35*).—This bulletin presents in tabular form the average acreage, production, and value of wheat in the United States by States and by years for the period 1866–1906.

Farm weeds of Canada, G. H. CLARK and J. FLETCHER (*Ottawa: Dept. Agr., 1906, pp. 103, pls. 56*).—This publication treats of the losses due to weeds and outlines the general principles to be applied for their prevention and extermination. A classification of weeds is given and the descriptive matter presented gives the salient points by which the seed of each plant represented may be recognized. In addition to illustrations showing the various parts of the plant such as the leaves, stem, roots, blossoms, and fruit, plates are given showing the seeds of many of these plants both in their natural size and also much enlarged. Brief notes are also included on ergot, couch grass, rye, and timothy. The description of each weed comprises its introduction, time of flowering, propagation, occurrence, injury, and remedy.

HORTICULTURE.

The fruiting habit of the grape, C. A. KEFFER (*Tennessee Sta. Bul. 77, pp. 35–46, figs. 5*).—The results are given of a study, made during 1906 in the station vineyard, of the fruiting habit of four commercial varieties of grape: Concord, Niagara, Delaware, and Brighton. Six systems of training are used, viz: Munson, Kniffin, double Kniffin, renewal, long-arm-short-spur, and cordon-horizontal. In the last two systems the new wood is cut back to 2 or 3 buds, in the others the growth is left from 6 to 12 or more buds, depending upon the system employed and the strength of the vine. In the renewal system the fruiting canes are grown either vertically or obliquely, while in the other systems the canes are trained horizontally.

With the view to observing the natural fruiting habit, as well as the effect of pruning and training, at least one cane of each variety was left unpruned. The unpruned canes were from 44 nodes long in the case of Concord, to 72 nodes long in the case of Delaware. A table is given showing the total number of buds, their location, and fruitage on the unpruned canes included in the study. Concord and Niagara failed to produce good fruiting laterals. With the Delaware the average weight of the bunches on the laterals was slightly greater than on the main cane, whereas in Brighton the bunches produced on the main cane were three times as heavy as on the laterals.

A table is given showing the best yields from a single cane of each variety, both unpruned and pruned. With only one variety, the Concord, was the total weight of fruit greater on the pruned cane than on the unpruned. The average weight of the bunches, however, was much greater in all cases on the pruned canes than on the unpruned. On the unpruned canes much of the fruiting wood died after maturing the crop. The conclusion is reached that table grapes should be pruned every year in order to make the crop profitable, since the single bunches are thus made heavier and the strength of the vine is less apt to be depleted by overbearing.

An effort was made to determine the weight of the fruit produced by each bud on the pruned canes, counting from the base of the cane upward. The number and location of all bunches of fruit on 37 vines were recorded when the berries first formed, and each bunch of mature fruit was weighed and recorded separately in order to show the total number of bunches from each bud. The results are tabulated and discussed. With all the varieties the base bud gave the lightest weight of fruit, and in each case the yield from the third bud was greater than that from the second. Arranging the buds in groups of three up to the twelfth node, it was found that Concord gave the best yield from buds 4 to 6, Niagara from buds 7 to 9, Delaware from buds 7 to 9, and Brighton from buds 7 to 9. With the exception of Concord, the average yield of the first 6 buds was less than that of the second or outer 6 buds. From this it is concluded that Concord is better adapted to the short-spur system of pruning and training than the other varieties named, although it is suggested that the number of spurs per vine should be reduced and the length of the spur increased to at least 6 buds. In long-cane systems horizontal training is considered preferable to upright or diagonal training, as the lower buds of the cane are thereby better nourished. The experiment is to be continued and the present results are regarded merely as tentative.

The influence of grafting on the quality of wines, J. Capus (*Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), Nos. 37, pp. 315–327; 38, pp. 345–356; 39, pp. 383–386*).—In the reconstruction of vineyards in the department of Gironde which were destroyed by phylloxera, several kinds of American vines were used as graft stocks upon which were grafted various scions taken from the native vines formerly in the vineyard. The author has made an extensive investigation for the purpose of determining whether the grafting of these scions from the native vines upon the foreign species has altered, ameliorated, or simply reproduced the various characteristics of the French grapes of Gironde with regard to bouquet, color, alcohol and acid content, etc. This study includes an examination of experimental results secured and analyses made at the Haut-Gardère experimental field by Messrs. Ricard, Verdie, and Bord, as well as investigations made in other parts of the department.

The data gathered with regard to the effect of grafting include its influence on the graft, on the form of leaves, the resistance to cryptogamic maladies, and the period of maturing, as well as its effect on the content of alcohol and sugar in the wine. The author concludes that the variations in sugar and acid content of the wine are of the same order and of the same amplitude as variations which have been noticed in the French vines themselves. With all other influences identical, such as climate, soil, culture, season, etc., a definite stock does not exert the same influence on scions of different varieties, and opposite variations may be noted from year to year where scions of the same variety are grafted on similar stocks. When the scions from native vines are grafted on various American stocks the results are equally confusing when compared with the behavior of similar scions growing on their own roots. No unusual variation was noted with regard to the form of the leaves and grapes, the period of maturity, etc. In short, in spite of the numerous grafted stocks studied during a period of 5 years, grafting does not appear to have produced anything new.

Rotundifolia grapes, C. C. NEWMAN (*South Carolina Sta. Bul. 132, pp. 18, figs. 8*).—Popular directions are given for the propagation, planting, pruning, training, fertilizing, and cultivation of the Rotundifolia type of grapes, together with descriptive notes of the more important varieties and data on some pruning experiments conducted to demonstrate the evil effect of late pruning.

With vines cut in October and November no bleeding took place, even when growth started in the spring. Where pruning is delayed until after December there is considerable loss of sap in the spring, and growth commences from a week to 10 days later than with vines pruned in the early fall. From one vine that was cut March 20, 23 lbs. of sap were collected in 4 weeks' time. The entire vine appeared to be affected and its growth considerably checked.

As a result of this work it appears advisable to prune during the months of October and November.

Notes on the operations of the royal American grape nurseries in Asti [Italy] from 1901 to 1906, G. PERSI (*Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 6 (1907), III, No. 8, pp. 919–929*).—This is a report on the operations conducted at the government grape nurseries at Asti in the production and distribution of grafts and cuttings of American vines.

Tables are given showing the species and varieties grown, and the number of vines distributed from 1901 to 1906, inclusive, together with data on grafting experiments and an outline of the course of instruction given at the grafting school. In all a total of 1,365,628 grafts and cuttings of American vines and hybrids were distributed from 1901 to 1906, inclusive.

The hybrid direct bearers at the Philippeville agricultural school in 1906, F. GODARD (*Bul. Off. Gouvt. Gén. Algérie, 1907, No. 17, Sup., pp. 287–315*).—This is a report on investigations made with all the well-known hybrid direct-bearing grapes in order to determine those most suitable for cultural purposes in Algeria. Notes are given on all the varieties tested, together with lists of those varieties resistant to cryptogamic maladies and drought, as well as the most productive kinds.

The spindel tree. A suitable dwarf tree form for commercial fruit growing (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1906, pp. 49–53, figs. 2; abs. in Deut. Landw. Presse, 34 (1907), No. 75, pp. 598, 599, figs. 2*).—Comparative data are given with regard to the training of dwarf fruit trees at the horticultural school at Geisenheim on the Rhine.

The three forms used were the bush, pyramid, and spindel shape trees, of which the last-named is said to have given highly satisfactory results. This form of tree, which appears to be a narrow, elongated type of the pyramid form, seems to be specially adapted for pears, to a lesser degree for apples, and unsuited for other orchard fruits.

The success accompanying the use of the spindel tree is said to depend to a considerable extent on the proper selection of stock, distance of planting, and method of pruning. The quince stock is commonly used for pears and the Paradise stock for apples. The planting distance recommended, where horse cultivation is to be used, is from 3 to 3½ meters (9.8 to 11.5 ft.) between the rows and 2 meters (6.5 ft.) between trees in the row. Care should be taken not to cut the leading shoot back too far, as this results in creating a strong growth in the side shoots. At least 12 eyes should be left on the main shoot, and the method of pruning recommended is the "half-moon shape" whereby all of the branches are exposed to the light.

Some data are given in regard to the yields obtained from this form of tree. During the past season 36 7-year old trees of Frau Luise Goethe yielded 683 fruits, valued at $21.42, and 36 7-year old trees of Madame Verté gave 3,420 fruits worth about $47.60. The spindel tree is to be more extensively planted in the orchards at Geisenheim.

Fruit growing and marketing in California, W. A. Boucher (*New Zeal. Dept. Agr., Dirs. Biol. and Hort. Bul. 17, pls. 24*).—A report to the New Zealand department of agriculture on the fruit and vegetable industry of California, with special attention to those kinds considered suitable for New Zealand conditions. Consideration is given to the varieties grown, the various cultural operations, orchard implements, harvesting, packing, marketing, etc. The text is accompanied with numerous illustrations of California orchard scenes.

Fruits for Pennsylvania, J. H. Funk (*Penn. Dept. Agr. Bul. 152, pp. 340, figs. 69*).—This bulletin treats of successful fruit production in Pennsylvania, including information with regard to the adaptability of different varieties of the apple, pear, peach, cherry, plum, apricot, quince, mulberry, and grape, as well as the methods of propagating, planting, pruning, fertilizing, cultivating, harvesting, packing, and marketing the important fruits.

Considerable attention is also given to harmful insects and fungus diseases and their control.

Report of the horticultural inspector of the agricultural society for the Rhein province on the inspection trip in Holland from May 17 to June 3, 1906 (*Landw. Ztschr. Rheinprovinz, 8 (1907), Nos. 32, pp. 461-463; 33, pp. 473-475; 34, pp. 485-487; 35, pp. 497, 498*).—A report on horticultural conditions in Holland, including an account of horticultural educational institutions, experimental stations, and commercial fruit and vegetable culture.

The fruits of the Dutch East Indies, F. A. von Stürler (*De Vruchten van Nederlandsch Oost-Indië. Tiel, 1907, pp. II+83, pls. 10, figs. 22*).—Botanical descriptions and brief general notes on the history, culture, varieties, and uses of the various fruits common to the Dutch East Indies are given, together with analytical tables showing the chemical composition of the more important fruits. The work concludes with brief directions as to the making of preserves, marmalades, and jellies, and an extensive bibliography on tropical fruits.

In view of the unsuccessful results secured with general farm crops during recent years the author is of the opinion that the development of the fruit industry can be undertaken with profit by many of the farmers.

The packing of apples in barrels and boxes, A. McNeill (*Canada Dept. Agr., Branch Dairy and Cold Storage Comr. Bul. 19, pp. 35, figs. 22*).—This bulletin contains a description of the important features of barrel and box packing, including a discussion of the package and packing house equipment and methods of grading and packing.

With regard to the use of boxes in place of barrels the author states that barrels are likely to maintain their preeminence as a package for apples as only the best grade of apples will pay in the boxes. The box is said to be the only practical package in which apples can be economically transported in a fit condition for the highest dessert trade. As a rule retail merchants prefer the boxes for a considerable part of their trade, whereas it appears that auction markets and fruit brokers of Great Britain do not take kindly to boxes.

The text is accompanied with several figures illustrating the various styles of pack, as well as by considerable information in regard to practices employed by successful fruit growers' associations.

The keeping quality of apples (*Country Gent., 72 (1907), No. 2853, p. 930*).—A tabulated list is given of the leading varieties of apples grown in the latitude of the State of New York, showing the approximate date for marketing together with the storage limit of each. In compiling this table special attention was given to the results secured by Powell in his fruit storage experiments (E. S. R., 15, pp. 581).

Early cider apples, A. TRUELLE (*Jour. Agr. Prat., n. ser., 14 (1907), No. 34, pp. 239, 240*).—The author conducted investigations to determine the relative value of cider produced from early apples as compared with that produced from later maturing apples. A table is given in which the cider from 20 of the superior early apples of Normandy and Brittany is compared with varieties of medium and late maturing apples, with regard to the density and the content of sugar, tannin, pectic compounds, albuminoids, and malic acid.

As a result of this investigation it appears that there are several of the early apples in which the chemical composition is quite similar to that of the later maturing apples and which are capable of making rich alcoholic cider of good lasting quality providing the inferior fruits are discarded. It is recommended that the cider made from early apples be fermented at the lowest possible temperature, after which it should be immediately drawn off into casks under a weak pressure of carbonic acid. A list is given of the varieties of early apples considered most suitable for cider making.

Plum culture in Massachusetts, F. A. WAUGH (*Mass. Crop Rpt., 20 (1907), No. 2, pp. 30–36*).—Popular directions for the cultivation of plums, including observations as to selection of soil and varieties, planting operations, pruning, cultivation, fertilization, pollination. diseases and insect pests and their control, and marketing.

Propagation, planting, and culture of citrus fruits, R. MARÈS (*École Agr. Algér. Maison-Carrée, Serv. Agr. Bul. 1, pp. 27*).—A popular bulletin on this subject, with special reference to citrus cultivation in Algeria. Observations are given on climate, varieties, soil, preparation of the soil, nursery practices, grafting, planting, pruning, fertilizing, irrigation, various insects, fungus diseases and their control, harvesting and marketing.

Seminal variation in the mango (*Trinidad Bot. Dept., Bul. Misc. Inform., 1907, No. 56, pp. 259, 260*).—During the past ten years a large number of seedling mango trees from seeds taken from some of the best named varieties have been raised at the experiment station, St. Clair, Trinidad. From the results here given it appears that the mango does not come true from seed. In this connection H. A. Nurse contributes a note on variation in seedlings of Mango D'Or. The seedling, while retaining a slight trace of the characteristic aroma, is said to possess none of the good qualities of the parent.

Planters are advised not to undertake the cultivation of seedling varieties but to preserve the best strains of fruit either by budding or grafting.

Spanish olive industry (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 3006, pp. 1–5*).—Statistics are reported by B. H. Ridgely with regard to the acreage, culture, crop, and yield in oil of the various Spanish provinces, together with a report by L. J. Rosenberg on the crop results, methods of harvesting, and production of oil in Andalusia.

The total area planted in olive trees in Spain and the Balearic Islands in 1906 is given as 3,323,577 acres, and the amount of oil extracted as about 38,356,164 gal.

Olive oil productions, D. I. MURPHY (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2997, pp. 1-4*).—A brief account is given of olive culture along the French Mediterranean coast, including varieties, cultural operations, harvesting, etc., and the manufacture of oil. The value of the olive oil exported from Bordeaux to the United States from 1902 to 1906, inclusive, is given as $1,615,716. Statistics are also given showing the production of oil in different Mediterranean countries from 1900 to 1905.

Green persimmons made marketable (*Cal. Fruit Grower, 36* (*1907*), *No. 1007, pp. 4, 5*).—According to this item, G. C. Roeding of Fresno, Cal., has been successful in curing Japanese persimmons by the method employed in Japan (E. S. R., 17, p. 618), which consists in placing the fruit in tubs from which sake or Japanese "rice beer" has been lately removed. The tubs are then hermetically sealed and the fruit is allowed to remain in them from 8 to 10 days, after which it appears to have lost its astringent qualities and may be eaten out of hand like an apple.

Tea in Formosa and Japan, W. H. UKERS (*Tea and Coffee Trade Jour., 13* (*1907*), *No. 1, pp. 11-24, figs. 27*).—This is a popular illustrated account of tea culture in Formosa and Japan, including statistics of production, varieties grown, and the methods of manufacturing and marketing.

Of the 115,000,000 lbs. of tea bought by the United States in 1906, Formosa is said to have supplied about 15 per cent, or 17,160,000 lbs. The Formosan tea shipment to the United States has remained approximately the same for several years. On the other hand, the tea export of Japan to the United States has decreased from 46 per cent of the whole amount consumed in 1885 to 32 per cent of the total in 1905. The consumption of Indian and Ceylon teas in America has increased from 2 per cent of the total in 1885 to 10 per cent in 1905. The decline in the consumption of Japanese teas is thought to be mainly due to the extensive advertising methods of the Indian and Ceylon tea planters.

While it is believed that the delicately flavored Formosa oolongs can never be marketed so cheaply as certain other coarser machine-manufactured teas, it is felt that in order to extend the trade they must be produced and marketed cheaper than at present.

The plant food requirements of the paprika plant (Capsicum), R. WINDISCH (*Ztschr. Landw. Versuchsw. Österr., 10* (*1907*), *No. 6, pp. 552-571, dgm. 1*).—A detailed account is given of fertilizer experiments conducted by the author during the season of 1902, to determine the food requirements of the red pepper. The text is accompanied with numerous tables, including meteorological data and analyses showing the production of organic substance, crude ash, and dry matter, and the assimilation of nitrogen, potash, and phosphoric acid during the growing season.

The seed was sown on March 20 and the plants set out on May 16. In all five analyses were made, the last about the middle of August. During the greater part of the growing season the more important plant foods were assimilated in regard to quantity in the following order: Potash, phosphoric acid, and nitrogen, while at the last examination the order was changed to phosphoric acid, potash, and nitrogen.

On account of the lack of comparative data the results of this experiment are not considered as conclusive.

A contribution to the history of the tomato, W. Dürkop (*Naturw. Wchnschr., 22 (1907), No. 35, pp. 545-550*).—This is largely a review of the literature on the early history of the tomato in various countries.

Strawberries: The newer varieties, F. H. Ballou (*Ohio Sta. Bul. 186, pp. 10, figs. 24*).—In this bulletin, notes, with illustrations, are given on the newer varieties of strawberries fruited for the first time in the season of 1907. Brief mention is also made of the more promising varieties tested in the 3 previous years and summarized lists are given of the varieties of greatest promise tested for the first time during the seasons of 1906 and of 1907, together with the best new extra early, mid-season, and late varieties, varieties of unusually good dessert quality, and those which have maintained their places as standards during the past 4 years.

Dewberries, F. C. Reimer (*Bul. N. C. Dept. Agr., 28 (1907), No. 8, pp. 27, figs. 9*).—This is intended as a preliminary popular bulletin on the cultivation of dewberries. The author discusses the types of soil, soil preparation, methods of propagation, planting, fertilizing, cultivation and subsequent care, anthracnose and its control, harvesting, and marketing. Results of experimental work being conducted with dewberries are to be published later.

The mulberry and other silkworm food plants, G. W. Oliver (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 119, pp. 22, pls. 7*).—The information contained in the author's previous bulletin on this subject (E. S. R., 14, p. 966) is here revised and brought up to date and deals with the methods of propagating the mulberry from seed, layers, cuttings, root grafting, scion or sprig budding, shield budding, and the raising of stocks for grafting and budding.

Consideration is also given to soils, planting, pruning, and food for early hatched worms, together with descriptions and illustrations of several varieties of mulberries. The white mulberry (*Morus alba*) is most prized for feeding silkworms. While the silk from the osage orange leaves is of a very fine quality, the young branches of the tree are thorny and the leaves wither and pack down after gathering, making them inferior to those of the mulberry. Young osage leaves fed to worms are said to cause disease.

In cases where the eggs hatch early in the spring, before the mulberry leaves have unfolded, lettuce leaves of the hard-leafed varieties and the oyster plant (*Tragopogon porrifolius*) may be used for a few days. Mulberry leaf buds are sometimes scraped off, mashed into a fine pulp, and fed to the newly hatched worms. Where these are used it is recommended that the terminal twigs of the trees be cut off and the buds on the pruned portions be fed.

Some notes on almonds, G. Quinn (*Dept. Agr. So. Aust. Bul. 5, pp. 11, figs. 8*).—Brief notes are given as to soil, climate, methods of propagation, pruning, etc., together with descriptions and illustrations of some of the so-called "soft shell" and "paper shell" varieties of almonds grown in South Australia.

Water lilies and other aquatics: Their relation to horticulture, G. V. Nash (*Jour. N. Y. Bot. Gard., 8 (1907), No. 93, pp. 202-220, figs. 5*).—This article is based on a lecture delivered by the author at the New York Botanical Garden in May, 1907, and deals with the artistic development of water gardens and the surrounding fringe or border. A large list of trees, shrubs, herbaceous plants, and grasses as well as aquatic plants are enumerated and discussed.

Beautiful gardens: How to make and maintain them, W. P. Wright (*London and New York, 1907, pp. XI + 307, pls. 2, figs. 73, dgms. 10*).—This popular work deals in an interesting manner with the artistic development of the home grounds, with instructions for making lawns and drives, flower gardens, herbaceous borders, rock, water, wall and wild gardens and ferneries, the planting of trees and shrubs, and the decoration of the house and pergolas. The text is accompanied with plans, designs, photographic illustrations, and colored plates, together with selections of flowers and plants for the various forms of planting, and particulars on how to grow them. The principles herein expressed are based upon the author's personal experience.

How to lay out suburban home grounds, H. J. KELLAWAY (*New York, 1907, pp. 112, pls. 38, dgms. 15*).—In this popular work the author treats of the development of small suburban grounds, with the view to combining practical utility with artistic surroundings. In the opening chapter attention is paid to the importance of treating the grounds as a whole and "counting the cost" before the construction of the house. Consideration is also given to the selection of the home site with reference to social, economic, and esthetic conditions. The details of development are discussed at length, including the treatment of difficult situations, the construction of lawns, gardens, walks and drives, and suggestions with regard to what and when to plant, including planting and cultural directions.

The work concludes with a discussion of the sphere of the landscape architect and the value of good design. The text is accompanied with several specimen preliminary plans, topographical maps, and grading and plans, as well as numerous photographs illustrating artistic development.

FORESTRY.

Handbook of the trees of the Northern States and Canada, R. B. HOUGH (*Lowville, N. Y., 1907, pp. X + 470, figs. 498, maps 140*).—This work includes photographic illustrations and descriptions of the native and naturalized trees of North America lying north of North Carolina, Tennessee, Arkansas, and Oklahoma, east of the Rocky Mountains, and extending southward in the Appalachian region to northern Alabama and Georgia. In each case the illustrations include trunks of specimen trees, branchlets with mature leaves and fruit, transverse sections of the wood showing the structure, and outline maps indicating the regions over which the trees are distributed. The work also includes a key to the families based mainly upon flowers, and a synopsis of the families and genera under discussion, with analytical keys leading to the species.

The forest trees of eastern Nebraska, C. E. BESSEY (*Proc. Iowa Acad. Sci., 13 (1906), pp. 75–87, figs. 67*).—Brief notes are given on the occurrence and direction of migration of the various families of forest trees growing in eastern Nebraska. The notes are accompanied with outline maps showing the distribution in that State of 67 different species.

Woods of Borneo, L. MAYNARD (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2993, pp. 14, 15*).—A list and notes on the use of the principal Borneo woods, together with a table showing the amount and value of timber shipped from the principal ports of North Borneo during 1905 and 1906. The export lumber trade is said to be principally to China, about 25,000 cu. ft. being exported yearly to European markets.

The swamp mahogany (Eucalyptus robusta), F. ALBERT (*La Caoba de las Vegas o Eucalyptus robusta. Santiago de Chile: Min. Indus., 1907, pp. 23, figs. 8*).—This is a monograph on the swamp mahogany, including a botanical description with common names and synonyms, the range and distribution, soil and climatic adaptability, seed collection, methods of propagation, planting and subsequent care, and notes on the timber and its uses. This species of eucalyptus is said to be adapted for marshy situations and even tolerates somewhat brackish water. The author recommends it for planting in such locations in Chili.

Note on Terminalia chebula and its fruit, the myrabolam of commerce, J. E. C. TURNER (*Indian Forester, 33 (1907), No. 8, pp. 362–365*).—A description is given of the tree and fruit, together with an account of its range and distribution, and the methods of harvesting and preparing the fruit for market. After being prepared, the fruit of the chebula, which is the myrabolam of commerce, is shipped to Europe for dyeing and tanning purposes.

Forest tables: Lodgepole pine, E. A. ZIEGLER (*U. S. Dept. Agr., Forest Serv. Circ. 126, pp. 24*).—In the course of general investigations considerable data have been gathered by the Forest Service relative to tree growth, form, and volume. In this circular measurements of lodgepole pine made by field parties in Wyoming in 1901 and 1905, and in Montana in 1902, are compiled and presented in tabular form. While they represent the results of many investigations, they are offered principally as suggestions for further investigations rather than as final. The various subjects considered are stand tables by well-recognized types and localities, reproduction tables, height and diameter growths, volume by feet and products, taper measurements, and present and potential yields.

Form and content of the white pine, A. SCHIFFEL (*Mitt. Forstl. Versuchsw. Österr., 1907, No. 32, pp. 89*).—This work consists of reference tables for computing the form and content of white pine, including form factor and form quotient tables, form and volume tables, and tables for computing volume and sorting wood having a diameter of over 7 cm. (about 2.8 in.) at the smaller end. The investigations upon which the tables are based, together with other necessary explanations, are given in the text.

A study of the botanical and physiological variations of Hevea brasiliensis with reference to selection, G. VERNET (*Jour. Agr. Trop., 8 (1907), No. 73, pp. 195–203, fig. 1*).—The author discusses the variability of this species of rubber, both with regard to its botanical features and also as to the composition of its latex and the yield from individual trees of commercial rubber. Tabular data are given from observations made on a large number of trees with regard to their yield in latex and rubber, and the author emphasizes the importance of a systematic study of the individual trees with a view to selecting seed for propagation from those which give the best returns.

Management of second growth in the southern Appalachians, R. ZON (*U. S. Dept. Agr., Forest Serv. Circ. 118, pp. 22*).—From 80 to 85 per cent of the total wooded area of the southern Appalachians is said to be second growth, a large proportion of which consists of even-aged stands, the results of cuttings either for charcoal or, more recently, for ties and mine timbers. This circular contains suggestions for the management of such even-aged stands for their best development for the future wood supply. The chief phases considered are economy in utilization, waste in cutting mine timber, betterment of methods of logging and lumbering, management of sprout forests, and protection from fire and other losses.

Considerable tabulated data are given showing the comparative waste in the production of cross-ties under the present system and the possible yields under more economical methods, as well as tables showing the height and diameter growth and sprouting vigor of different species of oak found in different types of forests. The effect of fire upon height growth of sprouts is also shown, as well as estimated yields of lumber, wood, and ties of second growth hardwoods in the Appalachian range.

Accretion investigations with firs, USENER (*Allg. Forst. u. Jagd Ztg., 83 (1907), Sept., pp. 305–310*).—In connection with the development of working plans in the State forests of Alsace-Lorraine data were collected with regard to the age and growth accretion of several thousand firs, including a counting of the annual rings both at the large and small end of the trees, and height and diameter measurements of the whole tree and parts suitable for logging purposes. The trees varied from 60 to 200 years old.

The results of this study are presented in tabular form and further tables are compiled with regard to the volume, value, and price increment for the different age classes studied.

The electric conductivity of trees, together with contributions to the question dealing with the causes of lightning stroke in trees, F. WOLFF (*Naturw. Ztschr. Land u. Forstw., 5 (1907), No. 9, pp. 425–471, figs. 8*).—A detailed account of the author's experiments along this line is given and the results secured are compared with other investigations.

The author comes to the conclusion that the conductivity of trees is extremely variable both as between different species and in the same species during different periods of growth. He also concludes that the electric conductivity of the tree is dependent upon the composition of the sap and its fluctuation in respect to quantity and constitution, rather than upon the content in fat as was formerly advanced by Jonesco. During the present investigations no definite conclusions were reached in regard to the causes of lightning stroke in trees.

The text is accompanied with several tables and figures, as well as by platted curves showing the variation of conductivity in trees at various seasons of the year.

On the saw pinching of Japanese woods, F. KOIDE (*Bul. Imp. Col. Agr. and Forestry, Japan, 1907, No. 1, pp. 27–71*).—Previous investigations by the author upon this subject were published in 1895 (E. S. R., 7, p. 871).

The present investigations were conducted to determine whether saw pinching occurs in green trees alone and the causes, as well as to establish numerical relations between the pinch measurement of a disk and its distance from the heartwood. The experiments are described and the results are set forth in numerous tables and further discussed.

Saw pinching appears to occur with air-dry wood as well as green wood, if it again becomes water-soaked. The higher the tree and the narrower the annual rings the smaller the average pinch measure. The pinch measure in the longitudinal measure of the tree shaft was too small to be taken into account. Pinching in air-dry wood is of little consequence when the saw cut is wide. The cause of pinching appears to be due largely to the resistance of the excess water in the wood cells against the saw, although it may depend to some extent upon the structure of the wood. The formulas as derived by the author as the result of investigations are also explained.

On the distribution of pressure in various forms of wood disks of Quercus salicina, F. KOIDE (*Bul. Imp. Col. Agr. and Forestry, Japan, 1907, No. 1, pp. 1–25*).—The author conducted investigations on the distribution of pressure in tangential and radial directions on disks of wood of various sizes and form, including complete disks, and 3, 4, and 6 cornered pieces of wood. The results of these investigations are here discussed with the aid of numerous formulas.

Progress report of forest administration in the Punjab for the year 1905–6, E. G. CHESTER (*Rpt. Forest Admin. Punjab, 1905–6, pp. 94*).—An account, with tabular data, is given of the operations of the Punjab forest administration for the year 1905–6, including constitution, management, protection, sylvicultural operations, methods of exploitation, and the financial statement for the year.

At the close of the year the Punjab forests of all classes comprised a total of 6,075,601 acres. The surplus of revenue over expenditure was 510,702 rupees (about $163,400) as compared with 458,637 rupees for the year 1904–5. The decrease in revenue is said to be due to the free distribution of timber to earthquake sufferers.

The lumber cut of the United States, 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 122, pp. 42*).—Statistical data prepared jointly by the Bureau of the Census and the Forest Service are given, showing the value and amount of lumber produced in the United States in 1906 by species, States, and classes. The data are based upon reports from 22,398 lumber manufacturers, and show a production of 37,550,736,000 ft., with a mill value of $621,151,388, in addition to which there were produced 11,858,260,000 shingles and 3,812,807,000 laths. The combined value of lumber, lath, and shingle production for 1906 was $656,796,513. Comparative data are given from 1899 to 1904 based upon the censuses of 1900 to 1905.

Although no detailed reports were received from Alaska, the total cut of the Alaskan mills in 1906 approximated 16,000,000 ft., of which about 15,000,000 ft. was spruce and the rest mainly cedar.

Consumption of pulpwood in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 120, pp. 10*).—Statistical data collected and compiled jointly by the Bureau of the Census and the Forest Service are given, showing the consumption of all kinds of pulpwood in 1906. The total consumption by 250 mills was 3,661,176 cords, or an increase of 469,053 cords over that of the previous year.

Detailed tables are given showing the kinds, amounts, and value of wood used in the production of pulp by species, States, and by the mechanical, sulphite and soda processes, together with comparative data showing the total amount of wood used for pulp in the mechanical and chemical processes in 1899, 1905, and 1906, and the imports and exports of wood-pulp for the period from 1902–1906. The amount of wood imported from Canada for pulp increased from 369,217 cords in 1899 to 738,872 cords in 1906. The total imports of wood-pulp in 1906 amounted to 157,224 tons, valued at $4,584,942, and the total exports amounted to 14,741 tons, valued at $587,878. It is estimated that the United States is exporting six-tenths of 1 per cent and importing 6.7 per cent of the total consumption of wood-pulp.

Consumption of cross-ties in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 124, pp. 6*).—Statistical data collected by the Bureau of the Census in conjunction with the Forest Service are given, showing the estimated consumption of cross-ties in 1906, based on the number of ties bought during a 12-month period.

Detailed tables show the kinds, number, and value of hewed and sawed ties purchased by steam railroads in 1905 and 1906, as well as those purchased by street railroads in 1906. The total number of cross-ties purchased by steam and street railroads in the United States during the latter year was 102,834,042, valued at $48,819,124, or an average of 47 cts. per tie at the point of purchase. The steam railroads purchased about nine-tenths of the whole number. The preservative-treated ties purchased by steam and street railroad companies amounted to 5,289,435, in addition to which 6,490,203 ties were treated at the company plants. The greater use of preservatives ties, which in 1906 amounted to 11.5 per cent of the whole number purchased, is due to the increasing necessity of using pine and other less decay-resistant woods.

Production of slack cooperage stock in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 123, pp. 8*).—Statistics were secured by the Bureau of the Census in conjunction with the Forest Service from 712 mills in 1906, showing the production of slack cooperage stock of all kinds, including staves, headings, and hoops.

The data are tabulated and show the production and value of the different products by species and by States. The total reported production was 1,097,063,000 staves valued at $6,081,880; 129,555,000 sets of heading worth $5,662,168, and 330,892,000 hoops valued at $2,486,517. Of the 14 kinds of wood used elm furnished more than one-fifth of the total number of staves, with pine and red gum ranking next. Ash staves showed the highest average value, $7.40 per thousand. Pine is the wood chiefly employed in the manufacture of heading, followed by elm, red gum, basswood, and beech. Elm is used chiefly for hoops, although considerable quantities of ash, oak, and birch are also used.

At present slack-stave production is said to center more in the northern and eastern States than in the southern States. The more important States producing heading are Virginia, Michigan, Illinois, Maryland, and Missouri. Approximately five-sixths of the hoops reported were produced in Ohio, Michigan, Indiana, Missouri, Tennessee, and Arkansas.

Production of tight cooperage stock in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 125, pp. 12*).—Tabular statistics prepared by the Bureau of the Census in conjunction with the Forest Service are given, showing the kinds, amounts, classes, and value of tight barrel staves and heading produced by States in 1906. Considerable comparative data for 1905 (E. S. R., 18, p. 745) are also given.

The total production of all kinds of tight barrel staves in 1906 was 267,827,000, as compared with 241,193,000 for 1905. Of heading 17,774,375 sets were produced in 1906, as compared with 12,959,000 sets in 1905.

Consumption of tanbark and tanning extract in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 119, pp. 9*).—Data collected by the Bureau of the Census in conjunction with the Forest Service show the consumption of tanbark for 1906 by 617 tanneries to have been 1,371,342 cords, valued at $12,774,071, or an average value per cord of $9.30. Hemlock and oak were the principal kinds of bark used, of which hemlock formed about two-thirds. In addition to the bark, 658,777 barrels of tanning extract were consumed, valued at $8,713,322. Domestic extracts are manufactured chiefly from chestnut, although considerable oak and hemlock are used. Quebracho, an imported wood extract, constituted the largest amount of any one kind used, exceeding chestnut extract by about 10,000 barrels, and in value by over $2,500,000.

Detailed tabulated data are given showing the quantity and value of tanbark and tanning extract of all kinds consumed by States, as well as the amount of tanning material imported in 1906.

Wood used for distillation in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 121, pp. 7*).—This circular contains statistical data collected by the Bureau of the Census in conjunction with the Forest Service, showing the kind, amount, and value of hardwoods and softwoods used for distillation and distilled products by States in 1906.

The statistics of hardwood distillation were based on reports from 86 plants and show a total consumption of 1,144,896 cords, valued at $3,716,423. Beech, maple, and birch are the principal woods used, and Michigan, Pennsylvania, and New York the principal States distilling hardwood. The principal products of hardwood distillation are charcoal, crude alcohol, gray and brown acetate, tar, and oil.

The quantity and value of softwoods distilled in 1906 are reported by 33 plants as 50,234 cords, valued at $129,358. The principal woods used are the southern pines, although operations have been started with the Douglas fir of the Pacific coast and the Norway pine of the Lake States. North Carolina, South Carolina, Georgia, Florida, and Alabama are the principal softwood distilling States, the chief products being turpentine, tar, oils, and charcoal.

Only 780,222 gals. of wood alcohol were exported in 1906, as compared with 1,097,451 gals. in 1905. The average price per gallon increased from 55 cts. in 1905 to 59.8 cts. in 1906.

DISEASES OF PLANTS.

Notes on plant diseases, T. W. KIRK (*New Zeal. Dept. Agr. Ann. Rpt., 15 (1907), pp. 141–171, fig. 1*).—Notes are given on a large number of diseases which have been under observation, among them the diseases of sweet potatoes; cherry leaf scorch, due to *Gnomonia erythrostoma;* diseases of garden plants, vegetables, field and forage crops, and fruit crops; and bacterial diseases of the pear, walnut, potato, cucumber, cabbage, hyacinth, and olive.

Among the diseases of fruit crops one is mentioned which is said to have been confused with the apple scab to a considerable extent. This is caused by the fungus *Coniothecium chomatosporum.* The first visible indication of infection consists of the appearance of minute cracks on the surface of the fruit. This is followed by the gradual peeling off of the skin in patches, giving the affected apples a russetted appearance, somewhat resembling that sometimes caused by Bordeaux mixture spraying. The tissues beneath the infected portions harden and crack, resembling in general the appearance of apple scab, but it may be distinguished by the absence of the velvety olive-colored patches which are characteristic of the Fusicladium. The Coniothecium is said to occur on leaves and twigs and probably winters over in cracks in the bark, so that winter spraying with strong Bordeaux mixture or a lime-sulphur wash is recommended.

The cereal rusts, I. B. P. EVANS (*Ann. Bot. [London], 21 (1907), No. 84, pp. 441–466, pls. 4*).—A detailed histological study was made of a number of the more common cereal rusts and their biological forms to determine the methods of attack by the parasite on the host plant, the subsequent growth of the parasite, and the mutual relations of host and parasite. In the present paper the attack of the parasite on the host plant is described.

The author found two forms of attack. In the first the germ-tube emitted from the spore penetrates the firm membrane or cuticle, this usually taking place with the sporidia developed from the teleutospores. In the other case the germ-tubes penetrate their host through the stomata, this method always being adopted by uredospores and æcidiospores.

Each set of phenomena observed was found to be very definite for each species, and the different species of Puccinia in the early stages of the uredo mycelium exhibit morphological characters which serve to distinguish them from one another. The substomatal vesicle has a definite shape for each species, being nonseptate, septate, or even multiseptate, and giving rise to one, two, or more infecting hyphæ, according to the species. In some species a well developed appressorium is present, while in others it is not so apparent.

The vegetative hyphæ of the different species closely resemble each other in size and general behavior, except in the case of *P. glumarum,* where they are much thicker than any of the other forms and contain a much greater number of nuclei.

The haustoria of some of the species are very distinctive, as is shown by the hammer-headed form commonly met with in *P. symphyti-bromorum,* whereas in *P. glumarum,* especially in the cells surrounding the vascular bundles, they are frequently branched, while in the chlorophyll cells the typical form is that of a small club-shaped body.

The slight morphological differences between the mycelia of *P. graminis* on wheat and *P. phlei-pratensis* are such as to be not worthy of specific characterization.

Seed infection by smut fungi of cereals, S. HORI (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 163–176*).—The author gives a summary of five years' experiments to determine the methods of infection of cereals by smut fungi. Experiments were carried on in which spores of fungi were mixed with soil, others in which seed was infected, and others in which infections were made through the flowers.

Summarizing his results, the author states that soil infection, although known in some cases, does not generally take place, at least not in Japan. The smuts of cereals may be classified according to their methods of natural infection as follows: Flower infection, *Ustilago tritici*, *U. hordei*, and *U. nuda*; seed infection, *U. panici-miliacei*, *U. crameri*, *Urocystis occulta*, and *Tilletia lævis*. *Ustilago maydis* is disseminated by the wind and may be developed upon the young tissues of any part of the plant. The experiments with *Ustilago reiliana*, *U. sorghi*, *U. avenæ*, *U. lævis*, and *Tilletia tritici* have not yet been completed.

Treating oats with formalin, RAUM (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 5 (1907), No. 11, pp. 127, 128*).—A description is given of a method of soaking oats for 15 minutes in a dilute solution of formalin, after which the seed was dried as quickly as possible. One lot of seed was left over night, and this dried much more slowly, owing to the greater depth of the pile of seed and the fact that in the rapid drying the grain was constantly shoveled. When tested, the seed that had been allowed to stand over night germinated only about 78 per cent as compared with 98 per cent where the seed was rapidly dried. The treatment so far as the reduction of smut was concerned was very efficient.

Notes on brusone of rice, J. V. D'ALMEIDA (*Rev. Agron. [Portugal], 5 (1907), No. 8, pp. 242–247*).—The author reviews and summarizes the work of Farneti on the causes and methods of control of rice brusone (E. S. R., 18, p. 946).

Disease in Louisiana sugar cane, H. R. FULTON (*La. Planter, 39 (1907), No. 20, pp. 313–315, fig. 1; Hawaii. Planters' Mo., 26 (1907), No. 10, pp. 365–371*).—After briefly calling attention to the diseases of sugar cane which are most commonly known, the author states that the only one with which Louisiana planters are at present concerned is the root disease, which has been attributed to *Marasmius sacchari*. A recent examination of material by Dr. W. G. Farlow has shown that the fungus is not the *M. sacchari* of Wakker, but is very similar to if not identical with *M. plicatus*, a species hitherto described as saprophytic in habit.

For the control of the disease the author suggests planting noninfected cane or the disinfection of cuttings with Bordeaux mixture.

A parasitic fungus on tapioca (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 7, pp. 204, 205*).—A brief description is given of a fungus disease of tapioca in which the leaves of the plant are attacked. The leaves first show discolored spots on both surfaces, and when well developed the central portion is dry and surrounded by irregular yellowish discolorations. The whole diseased area eventually becomes dry and falls out, leaving an irregular hole.

The disease does not seem to have produced very serious losses up to the present, but it should not be neglected, as it is thought that it might prove quite destructive. The fungus, which has not been definitely determined, appears to be a form of rust.

A rust of cabbage, L. TRABUT (*Bul. Agr. Algérie et Tunisie, 13 (1907), No. 14, pp. 355, 356*).—Attention is called to the presence on cabbage in Algeria of a true rust and to the fact that such parasites on the genus Brassica are unreported, so far as the author's investigations have gone. The fungus *Æcidium brassicæ* n. sp. is technically described. It is stated that *Puccinia isiacæ* on *Phragmites isiaca* is probably the uredo form of an Æcidium on certain cruciferous plants. As this grass is quite common in the irrigation ditches about gardens and was found to be infested with æcidia, its possible relation to the cabbage rust is indicated, and the destruction of the grass is recommended as a precautionary measure.

A disease of Japanese ginseng caused by Phytophthora cactorum, S. Hori (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 153–162, pl. 1*).—The author reports a serious loss through the attacks of *P. cactorum* on ginseng, which is cultivated quite extensively in a number of the provinces of northern Japan. The fungus was first definitely determined in 1904, and following its appearance the author recommended the spraying of the plantations with Bordeaux mixture. Where this was thoroughly done and two applications of the fungicide given, the spread of the disease was checked.

While investigating the cause of this disease, the author corresponded with a number of pathologists in this country who have been studying ginseng diseases, and he reports the almost simultaneous observation of the fungus in Ohio and Japan. A report has already been noted concerning the disease in Ohio (E. S. R., 18, p. 342).

Black scab or warty disease of potatoes, E. S. Salmon (*Gard. Chron., 3. ser., 42 (1907), No. 1093, pp. 397–399, figs. 4*).—A description is given of the black scab of potatoes caused by the fungus *Chrysophlyctis endobiotica*, and the author traces its spread throughout England. The disease is said to be a very serious one, and it is recommended that stringent measures be adopted for combating it. The author rejects the opinion hitherto published (E. S. R., 16, p. 169; 18, p. 149) that this fungus is identical with or related to *Œdomyces leproides*.

Winter rot of potatoes (*Bd. Agr. and Fisheries [London], Leaflet 193, pp. 2, fig. 1*).—A description is given of a disease of stored potatoes that is due to the fungus *Nectria solani*. This fungus is said to be almost constantly present on potatoes and only requires a hot, dry season to favor its rapid development. The tubers only are attacked, and if kept dry and exposed to the air no further development takes place. If, on the other hand, they are stored before being perfectly dry and placed in heaps so that the air is excluded and the temperature raised, within a short time the mycelium present in the tubers begins to develop, and later appears in the form of white tufts over their surface. From these tufts are produced crops of spores, which are rapidly distributed throughout the bins or heaps, producing a soft, ill-smelling rot.

The best preventive against attacks of this kind is to see that the potatoes are well dried before storing and to rotate crops, using kainit or lime on the land to destroy the fungus.

Fungus diseases of pineapples, F. A. Stockdale (*West Indian Bul., 8 (1907), No. 2, pp. 158–166*).—The principal diseases of pineapples described are tangle root, blight, black heart or core rot, and diseases of the fruit that appear during shipment.

The tangle root is a well-known disease characterized by the yellowing which begins at the tips of the leaves and gradually extends over the entire plant. The roots of such plants are wound about the body of the plants, hence the name tangle root. The cause of this disease is believed to be improper preparation of the land, and certain varieties seem to be more subject to this trouble than others.

The blight described is due to an unidentified fungus, and is characterized by the yellowing and drying up of the leaves, which during the progress of the disease lose their turgidity and become withered. The plant eventually dies and becomes rotten, and suckers from such plants are infested in a similar manner. The author recommends the digging up and destruction of all diseased plants and liming of the soil where they have grown.

The black heart or core rot described is said to be due to a species of Penicillium which attacks the fruit, the first indication of which is shown in the discoloration of certain segments which remain pale green while the rest of the fruit assumes the characteristic color of the ripening fruit. Sections through these diseased areas show black patches in the pulp, and these may spread until more or less of the fruit is involved. It appears that the fungus makes entrance to the fruit through injuries and probably through punctures made by the mealy bug and species of mites.

A disease of shipped or stored pineapples described is thought to be caused by *Trichosphæria sacchari*, and a second disease is attributed to *Diplodia* sp. In addition species of Penicillium and Aspergillus are frequently found on pineapples attacked by the other fungi.

In conclusion an account is given of the investigations of Cobb on pineapple diseases which have been noted elsewhere (E. S. R., 19, p. 154).

Diseases of coffee trees, G. Delacroix (*Agr. Prat. Pays Chauds, 7 (1907), No. 56, pp. 412–423, pl. 1*).—Descriptions are given of the canker of the coffee tree, which is attributed to *Rostrella coffeæ*, a disease common in Java which is due to *Corticium javanicum*, a root rot of the trees, caused by *Armillaria mellea*, and a number of other obscure diseases.

Cephaleuros virescens, the red rust of tea, H. H. Mann and C. M. Hutchinson (*Mem. Dept. Agr. India, Bot. Ser., 1 (1907), No. 6, pp. 35, pls. 8, figs. 2*).—The author states that algæ seldom do serious damage to economic plants, but attention is called to the red rust of tea caused by the alga *C. virescens*. This disease is distributed over a considerable portion of Assam, where it seems to occur locally and sometimes quite destructively. A description is given of the parasite, its method of reproduction and attack on the host plant, and a discussion of the causes of susceptibility to the disease.

The alga occurs on the tea leaves and shoots and on the seed coats. It appears to be the most serious trouble to which the tea plant is subject, and for its control the author suggests careful attention to pruning and spraying with Bordeaux mixture. As certain trees that grow almost everywhere in India are especially subject to attack, these should be removed from the vicinity of tea gardens so far as possible.

American gooseberry mildew (*Jour. Bd. Agr. [London], 14 (1907), No. 9, pp. 544–550, pl. 1*).—A description is given of the gooseberry mildew caused by *Sphærotheca mors-uvæ*, and a brief account presented of the life history of the fungus. Suggestions are made as to precautions against its introduction, the treatment of suspected and infected bushes, etc.

The distribution of the American gooseberry mildew in Germany and its control, R. Schander (*Deut. Obstbau Ztg., 1907, No. 23, pp. 353–357*).—A description is given of the gooseberry mildew caused by *Sphærotheca mors-uvæ*, and attention called to its distribution throughout Germany.

For the control of this disease the author recommends spraying with potassium sulphid solution, the information being based very largely upon experiments carried on at the New York State Station (E. S. R., 11, p. 945).

Experiments on the control of grape downy mildew, B. Tomei (*Staz. Sper. Agr. Ital., 40 (1907), No. 4–5, pp. 371–390, figs. 3*).—An account is given of experiments made during 1906 for the control of the downy mildew of grapes. Spraying experiments in three vineyards were carried on in which different fungicides were tested, among them, Bordeaux mixture made by different formulas, a fungicide in which equal parts of sulphate of copper and sulphate of iron were used in connection with lime, and a proprietary fungicide, the principal constituent of which is acetate of copper.

The results of the experiments are described at considerable length, and the author recommends for practical purposes a Bordeaux mixture containing 0.5 per cent copper sulphate with enough lime to neutralize the solution.

The relation between the gray rot of grapes and the quality of wines, G. Gouirand (*Rev. Vit., 28 (1907), No. 729, pp. 621–624*).—The author states that *Botrytis cinerea* on the grape is commonly accompanied or followed by a number of fungi, each of which produces a characteristic effect upon the fruit. In pressing grapes where the gray rot has been prevalent, care should be exercised to separate those attacked by the different fungi, as these cause a pronounced flavor that results in a marked inferiority of wine.

The superiority of hybrids in resistance to the gray rot of grapes, A. Berget (*Rev. Vit., 28 (1907), No. 727, pp. 576–578*).—Attention is called to the resistance of certain grape hybrids toward gray rot, the observations being made during the season of 1907, in which the disease was particularly abundant. Of the more resistant forms, most of them were found to be hybrids in which American varieties quite largely entered.

The principal species of fungi attacking construction timber, L. Grandeau (*Jour. Agr. Prat., n. ser., 14 (1907), No. 36, pp. 297, 298*).—A description is given of the dry rot of construction timber due to *Merulius lacrymans*, which is said to be by far the most destructive of fungi on this class of timber. In addition the injury caused by *Poria vaporaria* is described.

New western species of Gymnosporangium and Rœstelia, F. D. Kern (*Bul. Torrey Bot. Club, 34 (1907), No. 9, pp. 459–463*).—Technical descriptions are given of 3 new species of Gymnosporangium occurring on junipers in Colorado and adjacent regions, and also of 3 species of Rœstelia found on species of Cratægus and Amelanchier.

The red disease of firs in the Jura region, E. Henry (*Rev. Eaux et Forêts, 46 (1907), Nos. 22, pp. 673–682; 23, pp. 705–710*).—This is a detailed paper, the substance of which has already been noted (E. S. R., 19, p. 657).

Insect agencies as a cause of larch canker, J. Scott (*Jour. Bd. Agr. [London], 14 (1907), No. 9, pp. 551–554, figs. 4*).—The author calls attention to the rôle of certain insects in spreading the larch canker fungus, particularly the fungus fairy fly (*Cœcilius flavidus*).

Influence of Chermes on larch canker, E. R. Burdon (*Gard. Chron., 3. ser., 42 (1907), No. 1091, pp. 353–355, figs. 6*).—A discussion is given of the relationship between the larch canker caused by *Dasyscypha calycina* and certain species of Chermes. The fungus is believed to be a wound parasite, and the conditions offered by the insect seem peculiarly adapted to its development.

Spraying young trees late in winter or early in spring with kerosene emulsion was found to be quite destructive of the insect and did not injure the trees. Consequently the liability to fungus infection was greatly lessened.

A remedy for the spruce gall and larch blight diseases caused by Chermes, E. R. Burdon (*Jour. Econ. Biol., 2 (1907), No. 2, pp. 54–67*).—An account is given of the relation between the Chermes and the larch canker due to *Peziza willkommii* and the spruce gall caused by *Septoria parasitica*.

The author has carried on some experiments that seem to indicate the practicability of combating these diseases by the use of kerosene emulsion thoroughly applied to the trees during the winter season. When sprayed over young trees in January, examinations made several months later failed to show any live insects and there was a conspicuous reduction in the amount of disease.

Almost as good results were given in another series of experiments in which the solution used was simply a strong soft soap solution, made by dissolving 1 lb. of soap to 1 gal. of water.

Branch cankers of rhododendron, H. von Schrenk (*Mo. Bot. Gard. Ann. Rpt., 18 (1907), 77–80, pls. 2, fig. 1*).—The author reports having noticed for several years peculiar canker-like growths on the branches of *Rhododendron maximum*. These cankers appear in the form of large swellings of peculiar shape, and a large shrub may have anywhere from 1 to 40 or 50 cankers, sometimes 2 or 3 occurring on one branch. The parts of the branch above and below the canker appear normal, and the canker does not seem to influence materially the growth or development of the branch upon which it is situated. It appears to be simply a localized swelling which does not exert any influence upon the branch.

A careful examination showed that the cankers always originate around a small dead branch and that they are primarily due to an attempt on the part of the branch to heal over a dead stub. When a lateral branch dies the wood of the parent branch or trunk begins developing a healing layer at a considerable distance from the base of the dead branch. The rate of growth on the rhododendron is very slow, and consequently it requires a long time to completely heal over a wound. On account of this slow growth the callous lips increase from year to year, giving rise to the knots or swellings which are described.

This abnormal condition is described to call attention to the fact that pathological conditions may arise without direct interference from other living organisms.

Studies in root parasitism, C. A. Barber (*Mem. Dept. Agr. India, Bot. Ser., 1 (1907), No. 1, pt. 2, pp. V+58, pls. 16*).—In continuation of a previous paper (E. S. R., 18, p. 348) the author gives further results of his studies in root parasitism as exemplified by *Santalum album*. Detailed descriptions are presented of the structure and development of the haustoria, methods of attack and penetration, and the inter-relations between the host and its parasite. The penetration of the host tissues seems to be effected by pressure on the root of the host and by secretions from the haustoria of the parasite. The protection against the parasite is mainly secured by the development by the host of thick walled tissues or cork layers about and in the path of the advancing haustoria.

On the presence of copper in vineyard soils, O. Prandi (*Staz. Sper. Agr. Ital., 40 (1907), No. 7–8, pp. 531–544*).—After a review of literature relating to the effect of copper accumulating in soils where spraying has been continuously practiced for a long time, an account is given of a series of experiments conducted to determine the amount of copper present in soils of vineyards where heavy spraying with Bordeaux mixture had been practiced. These experiments were begun in 1904 and are to be continued indefinitely. Samples weighing 1,000 gm. were taken of the soil and subsoil as near to the grapevines as possible, and after the removal of all sticks and trash the sample was leached with a 10 per cent ammonia solution or with carbonated water and the amount of copper in the solutions determined as copper oxid.

The amounts thus far obtained have not been sufficient to cause any injury, but on account of the action of very dilute solutions of copper on bacteria, the author thinks that the copper in the soil may have an important bearing on the activity of soil organisms.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Zoology of the Transvaal (*The Transvaal and Its Mines. London and Johannesburg, 1906, pp. 94–149, figs. 99*).—A descriptive account is given of the numerous game birds and mammals found in the Transvaal, together with a brief account of the reptiles, amphibians, fish, and insects. The zoological gardens at Pretoria are well stocked with a variety of the most important and interesting animals of the country. A government reserve has been established for the protection of game and much is hoped for this movement in the future.

Trapping rabbits at tanks or dams (*Jour. Dept. Agr. So. Aust., 10 (1907), No. 12, pp. 833, 834, figs. 2*).—A description and illustrations are given of a device for trapping rabbits when they seek watering places.

The international convention for the protection of birds concluded in 1902; and Hungary, O. HERMAN (*Budapest, Govt., 1907, pp. VII + 241*).—The international convention regarding the protection of birds was concluded in Paris in 1902 and was put into operation in Hungary in 1906.

A copy is given of the text of the Hungarian law together with lists of birds which should be protected, and the results which have followed this national movement to protect birds are briefly outlined.

Attention is called to the fact of the decrease of useful birds and the increase in the numbers of destructive insects. These two phenomena are believed to be definitely correlated.

Economic ornithology in relation to agriculture, horticulture, and forestry, F. V. THEOBALD (*Sci. Prog. Twentieth Cent., 2 (1907), No. 6, pp. 263–283*).—The economic status of the common species of birds in England has not been determined with sufficient accuracy. The author calls attention to the fact that in some countries in which birds are shot at all times of the year insect and other pests are no worse than where birds are protected by law. The sparrow, bull finch, sparrow hawk, and certain other species are condemned as injurious, while the kestrel, owls, tits, and most gulls are beneficial, or at least not injurious. Further study of the feeding habits of these birds is necessary before more definite statements can be made regarding their economic importance.

American economic entomology, R. LYDEKKER (*Sci. Prog. Twentieth Cent., 2 (1907), No. 6, pp. 211–225*).—A general review is given of the work of the Bureau of Entomology of this Department with particular reference to the investigation of cotton boll weevil, mosquitoes, San José scale, gipsy moth, forest insects, bees, etc.

Insect notes for 1907, EDITH M. PATCH (*Maine Sta. Bul. 148, pp. 261–282, pls. 3*).—Mention is made of the present status of the gipsy and brown-tail moths in Maine. During the year great damage was done to hardwood forests by *Heterocampa guttivitta*. Biological and economic notes are also given on the forest tent caterpillar, apple-tree tent-caterpillar, cherry-tree tortrix, and various other orchard insects, grasshoppers, strawberry weevils, cucumber beetles, rose chafers, sawflies, gall insects, etc. The tarnished plant bug was present in enormous numbers during the previous fall, but in May following it was found by examination of its hiding places that it had been largely destroyed by the attacks of ground beetles. A number of experiments were made in feeding ground beetles, particularly *Pterostrichus lucublandus*, on various species of insects. The ground beetles were found to be extremely voracious.

Insect and other cotton pests and the methods suggested for their destruction, G. C. DUDGEON (*Bul. Imp. Inst., 5 (1907), No. 2, pp. 140–166*).—Biological and economic notes are given on boll worm, *Earias insulana*, *E. fabia*, cotton worm, fall army worm, cutworms, various species of flies, locusts, ants, cotton boll weevil, etc.

Some factors in the natural control of the Mexican cotton boll weevil, W. E. HINDS (*U. S. Dept. Agr., Bur. Ent. Bul. 74, pp. 79, pls. 4, figs. 2*).—The present bulletin contains a record of a series of observations particularly on four factors, viz., temperature, moisture conditions, natural enemies, and food supply as affecting the control of the boll weevil, in the belief that a careful study of the various natural agencies will serve as a basis for artificial means of combating this pest. The author, in studying these various factors, directed chief attention to determining as accurately as possible the relative influence of each factor.

The boll weevil has been found capable of considerable adaptation to conditions of temperature and humidity. It appears, however, as a result of observation and experiment that with the presence of a fair amount of moisture in the soil until the squares begin to form and a following period of hot dry weather for 4 to 6 weeks, the boll weevil may be expected to be considerably checked. A continuous dry season is likewise unfavorable to a multiplication of the weevils, but also badly affects the cotton crop. The boll weevil is considerably reduced by the occurrence of changeable weather with frequent low temperatures and rainfall in winter. The defoliation of cotton by leaf worms may result in depriving a number of weevils of sufficient food late in the season.

About 70 per cent of the weevils developed in the field are found in fallen forms and the mortality among such weevils is much greater than in those which remain in hanging forms. The factors of natural control operate more effectively against weevils in squares than against those in bolls. Particular attention was given to a study of the agency of an ant belonging to the species *Solenopsis geminata* in the control of the weevil. In this work more than 86,000 forms were examined. It is believed that the ant in question is of more importance in the control of the weevil in summer than are heat and parasites combined. The ants appear to enter only those forms which contain living stages of the weevil. All of the parasites which attack the boll weevil have other hosts and do much more effective work in hanging than in fallen forms.

The degree of benefit obtained from natural control was found to be highest in southern Texas and lowest in the southwestern part of the State. In combination with natural means of control, cultural methods should be adopted which will hasten the maturity and increase the yield of the crop.

Studies of parasites of the cotton boll weevil, W. D. PIERCE (*U. S. Dept. Agr., Bur. Ent. Bul. 73, pp. 63, pls. 3, figs. 6*).—At present parasites are not considered one of the most important factors in the control of the boll weevil, but it is believed that their importance may be considerably increased by the adoption of practical methods of encouragement. Fifteen species of insects are known to prey upon the immature stages of the cotton boll weevil. These parasites are native to this country and have been known for some time as parasites of other species of weevils within the territory infested with the cotton boll weevil. Some of the weevils other than the cotton boll weevil are quite effectively held in check by the parasites. The distribution of the weevils related to the cotton boll weevil varies greatly according to species.

It is urged that the information thus far obtained relating to the life history of weevil parasites may be utilized in controlling the boll weevil by propagating and collecting the parasites and by eliminating related weevils, thus forcing the parasites to attack the boll weevil. The bulletin contains a detailed account of work done in the study of weevil parasites in 1906, including the breeding records, conditions favorable for parasitism, field conditions, geographical distribution, propagation of parasites, and the study of the sources from which parasites may be obtained. The exact conditions which bring about instances of excessive parasitism are not thoroughly understood. Some of the factors of the problem, however, are to be sought in relative moisture and light, resistance of plants to weevil injury, and abundance of other species of weevils in the vicinity of infested cotton. Experiments on a small scale in releasing parasites have been found to increase the extent of parasitism. This method will be tried on a large scale.

The genus Eutettix, with special reference to E. tenella, the beet leaf hopper, E. D. Ball (*Ohio State Univ., Contrib. Dept. Zool. and Ent., No. 27, pp. 27-94, pls. 4*).—Sugar-beet leaves are sometimes affected in Utah with a peculiar condition known as curly leaf or blight. This has been found to be due to the attacks of *Eutettix tenella* and other species of this genus. On the basis of biological and anatomical characters the author has proposed a systematic revision of this genus. A great variety of material was examined representing the species of the genus as found in various parts of the United States. Detailed technical descriptions are given of all these species, together with analytical tables to assist in their identification.

In the year 1905 *E. tenella* is believed to have caused damage to sugar beets to the extent of $500,000 in Utah. In 1906 the leaf hoppers were not so numerous. All species of this genus thrive best in hot, dry situations, and it has been found that they may be partly controlled by thorough and frequent irrigation.

A myriapod injurious to garden crops, Dublesel and J. Béziat (*Jardin, 21 (1907), No. 20, p. 247*).—A myriapod belonging to the species *Blaniulus guttulatus* has been found to cause serious injury to peas, beans, potatoes, sugar beets, etc., in gardens. The main damage is done by attacking the seed in the ground.

Cutworms, H. T. Fernald (*Massachusetts Sta. Circ. 2, pp. 2*).—Brief notes are given on the life history of cutworms. These pests may be effectively controlled by clean culture and the use of poisoned baits made of clover or bran and some arsenical.

Wireworms, C. E. Hood (*Massachusetts Sta. Circ. 4, pp. 2*).—In the control of wireworms clean cultivation is recommended combined with fall plowing, the use of poison baits, and a short system of rotation.

Root maggots, H. T. Fernald (*Massachusetts Sta. Circ. 5, pp. 2*).—The cabbage maggot may be controlled at least in part by the use of tar paper collars around cabbage and cauliflower plants. Onion maggots are to be checked by the application of carbolic acid emulsion.

The melon louse, A. F. Conradi (*Gulf Coast Mag., 3 (1907), No. 1, pp. 47-53, figs. 6*).—This pest has caused serious depredations since 1854. The nature of the damage caused by the insect is briefly described. The best results in combating the pest have been obtained from fumigation with a preparation of nicotine. The encouragement of its natural enemies is also recommended.

Some items of information for orchardists and fruit growers relative to certain dangerously injurious insects and diseases, G. G. Atwood (*N. Y. Dept. Agr., Bur. Hort Insp. Bul. 1, pp. 20, pls. 48*).—For the guidance of fruit growers in combating insect and fungus diseases, detailed directions are given for the preparation of lime-sulphur wash and Bordeaux mixture for the control of San José scale, peach yellows, leaf curl, crown gall, apple scab, grape root worm, etc.

The apple maggot or railroad worm, C. E. Hood (*Massachusetts Sta. Circ. 3, pp. 3, figs. 2*).—The life history of this insect is briefly outlined. The only remedy suggested for combating the pest consists in collecting and destroying all windfall apples.

The lecaniums or soft scales, C. E. Hood (*Massachusetts Sta. Circ. 6, pp. 3*).—Brief biological and economic notes on apricot scale, New York plum scale, terrapin scale, tulip scale, and hemispherical scale.

The San José scale, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 6, pp. 171-200, pls. 4*).—A brief account is presented as to the origin, injurious attacks, food plants, appearance, distribution, life history, natural enemies, and means of combating San José scale. Of the various insecticides which have been used in controlling this insect, the self-boiled lime-sulphur wash is considered the best. Directions are given as to the time of spraying and formulas are presented for the preparation of various other insecticides.

The scale insects of the date palm, T. D. A. COCKERELL (*Arizona Sta. Bul. 56, pp. 183–192, pls. 5*).—A historical account is given of the importation of date palms from Cairo, Algeria, and elsewhere, and the accidental introduction upon these plants of *Parlatoria blanchardi* and *Phoenicococcus marlatti.* These insects are described and notes are given on their habits, natural enemies, and distribution.

The extermination of date-palm scales, R. H. FORBES (*Arizona Sta. Bul. 56, pp. 193–207, figs. 5*).—After the establishment of date-palm orchards in Arizona it was found that the plants were infested with *Parlatoria blanchardi* and *Phoenicococcus marlatti*, the first species being the most important. A considerable number of insecticide treatments were tried in attempts to control this pest, including kerosene emulsion, whale-oil soap, distillate spray, resin wash, and fumigation with hydrocyanic-acid gas. The experiments showed that date palms are exceedingly resistant to all of these insecticides, but that none of the lines of treatment was effective in destroying the scale insects.

After the failure of other insecticides, resort was had to the use of the gasoline blast torch. The infested trees were severely pruned back and were then scorched with the torch. The results were very satisfactory. It was found that the trees could be freed from scale insects by means of heat without suffering any harm, trees thus treated making as vigorous growth the next season as untreated trees. In an orchard of 100 trees cut back and scorched with the gasoline torch on the station farm, only one young seedling died. The experiments thus far conducted do not indicate that this method of treatment is particularly expensive.

Diaspis pentagona, D. CAVAZZA (*Ann. Uffic. Prov. Agr. Bologna, 13 (1906), pp. 62–70*).—This insect has been found in the province of Bologna, where it is causing great damage to mulberry trees. The author calls attention to the injury which its further spread may cause and urges strict measures for its control.

Insects injurious to the vine in California, H. J. QUAYLE (*California Sta. Bul. 192, pp. 99–140, figs. 24*).—Although about 275 species of insects have been recorded as feeding upon grapes there are not more than 15 or 20 which really cause serious injury to grapes in California. Nearly all of the injurious species in California are native insects.

The phylloxera has been known in California since 1874 and is believed to have destroyed about 50,000 acres of grapes. The life history of this pest is described. The most effective remedy has been found in planting resistant vines. The vine hopper (*Typhlocyba comes*) is particularly injurious in the Sacramento and San Joaquin valleys. It is best controlled by clean cultivation, the use of hopper cages, and spraying with whale-oil soap or resin wash. *Adoxus vitis* has a life history very similar to that of the grape root worm of the Eastern States. It may be controlled by jarring, by the use of the hopper cage, by the application of an arsenical spray, and by thorough cultivation of the soil about the roots of infested grapes.

Economic and biological notes are also given on *Philampeles achemon*, grasshoppers, cutworms, army worms, flea-beetles, *Desmia funeralis*, leaf chafers, wireworms, *Eriophyes vitis*, nematode root gall, etc.

The catalpa sphinx, L. O. HOWARD and F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Circ. 96, pp. 7, figs. 2*).—*Ceratomia catalpæ* is described in all its stages and notes are given on its distribution, life history, habits, and natural enemies. It is held in check to some extent by parasitic insects and birds.

The artificial remedies suggested include handpicking, the use of arsenicals, the destruction of pupæ, and the protection of parasites.

A phylloxera upon the roots of the oak, B. Grassi and Anna Foà (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 16 (1907), No. 7, pp. 429–431*).—On the roots of *Quercus sessiliflora*, the author found large numbers of *Phylloxera corticalis* which cause characteristic tubercles as a result of their attacks. The economic importance of this insect has not been definitely determined.

The Monterey pine scale, D. Moulton (*Proc. Davenport Acad. Sci., 12 (1907), pp. 1–25, pls. 4, fig. 1*).—A careful study was made of the life history and habits of *Physokermes insignicola* which appears to infest only the Monterey pine. The insect is described in its various stages. The reason for the secretion of honeydew is not well understood.

Among the important natural enemies of this scale insect mention is made of *Rhizobius ventralis*, *Microterys sylvus*, etc. The internal and external anatomy of the scale is described.

The reproduction of Hylesinus piniperda, E. Knoche (*Forstw. Centbl., n. ser., 29 (1907), No. 8, pp. 474–480*).—Large numbers of this insect were kept under observation for the purpose of determining their breeding and egg-laying habits. When kept in breeding cages, it appears that *H. piniperda* may lay some eggs which have not been fertilized, but those eggs do not develop parthenogenetically.

Some insect pests of rubber, H. C. Pratt (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 8, pp. 244–251*).—*Rhodoneura myrtæa fenestrata* causes serious damage to gutta-percha. This insect is described in its various stages. The larva commences its work upon the leaves of young shoots, mining in them and sewing the leaves together.

The merbau is also attacked by two unidentified species of Lepidoptera. In combating these insects it is recommended that infested leaves should be promptly gathered by coolies and destroyed.

The Hymenoptera of Middle Europe, O. Schmiedeknecht (*Die Hymenopteren Mitteleuropas. Jena, 1907, pp. VII+804, figs. 120*).—The author is impressed with the unsatisfactory nature of isolated pamphlets and articles widely scattered in different publications. Many years have therefore been devoted to a comprehensive study of the Hymenoptera of Middle Europe for the purpose of bringing descriptions of these species together in a handbook for the use of systematic entomologists. The volume includes an account of the external anatomy of Hymenoptera, their mode of life, the collection of these forms, the general principles of classification, and a detailed monograph of the group arranged under 22 families.

Bee keeping: Some suggestions for its advancement in Massachusetts, B. N. Gates (*Mass. Crop Rpt., 20 (1907), No. 4, pp. 26–36*).—The general problems of bee keeping are discussed with particular reference to the possibilities of this industry in Massachusetts. Notes are given on the diseases of bees and on methods of caring for bees and bee appliances.

Wax moths and American foul brood, E. F. Phillips (*U. S. Dept. Agr., Bur. Ent. Bul. 75, pt. 2, pp. 19–22, pls. 3*).—It is sometimes claimed that wax moths are of some benefit in destroying comb infected with foul brood. The commonest species of wax moth is *Galleria mellonella*, but the lesser wax moth (*Achroia grisella*) is also sometimes found in beehives. Both of these species were found by experiment to burrow through combs affected with foul brood, but neither species fed upon the dried remains of bee larvæ dead of the disease.

Wax moths, therefore, can not be considered as assisting in the control of foul brood.

Production and care of extracted honey, E. F. PHILLIPS (*U. S. Dept. Agr., Bur. Ent. Bul. 75, pt. 1, pp. 1–15*).—The terms strained honey and extracted honey have been applied to honey which has been rendered free from comb by straining the comb honey or removing the honey from the comb by the centrifugal machine. The chief purpose of the article on extracted honey is to give information on the main principles to be observed in preparing this product.

The advantages of extracted honey are briefly discussed and detailed directions are given regarding the technique of producing this product. The best honeys are obtained by allowing sufficient time for normal ripening. Since, however, one of the most constant physical evidences of ripeness of honey is the proper water content, artificial ripeners have been devised in which the excess amount of moisture in unripe honey is driven off by heat. The aroma of such honey is not equal to that of honey allowed to ripen naturally.

The extent and rapidity of granulation of honey depends to some extent on the plants from which the honey was made. Granulation takes place much more rapidly in alfalfa honey than in white-sage honey. In the case of infection with foul brood, it is permissible to heat honey to a temperature higher than 160° F. Directions are given for packing extracted honey and for the production of candied honey. A table is presented showing the different types of honey.

Methods of honey testing for bee keepers, C. A. BROWNE (*U. S. Dept. Agr., Bur. Ent. Bul. 75, pt. 1, pp. 16–18*).—The most frequent forms for the adulteration of honey consist in the addition of glucose, cane sugar, and invert sugar. The standard at present adopted for honey permits the presence of 25 per cent of water. This standard is believed to give a sufficiently wide margin, since the average water content of samples of pure honey is about 17.5 per cent.

Simple methods of honey testing are given for the use of bee keepers. Water may be determined by the use of a specific gravity float. Beckmann's colorimetric test is recommended for the detection of commercial glucose. Artificial invert sugar may be detected by diluting the honey with an equal volume of water and so adding a freshly prepared concentrated solution of anilin acetate as to form a thin layer on the surface of the liquid. If artificial invert sugar is present a red ring will form beneath this layer, the intensity depending upon the quantity of invert sugar in the mixture.

The first stages of French butterflies, M. C. FRIONNET (*Les Premiers États des Lépidoptères Français Rhopalocera. Saint Dizier, 1906, pp. LXII + 321*).—Entomologists everywhere recognize the need of careful study of the larval stages of insects for purposes of comparison and classification. This field of work has been covered by the author with regard to the caterpillars of French butterflies. The larval stages of these insects are described and elaborate analytical tables are given to assist in their identification in these stages. A bibliography of the subject is also presented.

A chalcidid parasite of the tick, L. O. HOWARD (*Ent. News, 18 (1907), No. 9, pp. 375–378, pl. 1, fig. 1*).—Ticks belonging to the species *Hæmaphysalis leporispalustris* obtained from rabbits in Texas were found to be parasitized by a tick belonging to a new genus and species. This tick is described under the name *Ixodiphagus texanus*.

Bibliography of Canadian entomology for the year 1905, C. J. S. BETHUNE (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 12 (1906), Sec. IV, pp. 55–65*).—A list is given of literature regarding Canadian entomology published in 1905, arranged alphabetically under authors.

FOODS—HUMAN NUTRITION.

The proteins of the wheat kernel, T. B. Osborne (*Carnegie Inst. Washington Pub. 84, pp. 119*).—The author summarizes available data on the nitrogenous constituents of the wheat kernel and reports a number of investigations on the amount and characteristics of these bodies and related questions. Quotations from the author's summary follow:

"The proteins of the wheat kernel are gliadin, insoluble in neutral aqueous solutions, but distinguished from all the others by its ready solubility in neutral 70 per cent alcohol; glutenin, a protein having a similar elementary percentage composition to gliadin, soluble in very dilute acid and alkaline solutions, but insoluble in dilute alcohol or neutral aqueous solutions and yielding a wholly different proportion of decomposition products when boiled with strong acids; leucosin, an albumin-like protein, freely soluble in pure water and coagulated by heating its solution to 50 to 60°; a globulin similar in composition and properties to many globulins found in other seeds, and one or more proteoses which are present in very small quantity. It has also been shown that the proteins obtained from the embryo of the wheat are the globulin, albumin, and proteose above mentioned, and that these form nearly all of the protein substance of this part of the seed. It thus appears that these three proteins are contained chiefly in the embryo, and that gliadin and glutenin form nearly the whole of the proteins of the endosperm, or over 80 per cent of the total protein matter of the seed. It is possible that a part of the albumin, globulin, and perhaps minute quantities of the proteose are contained also in the endosperm, for these proteins are always found in flour from which, in the milling process, the embryo is very nearly completely separated. . . .

"Gluten contains the greater part of the protein matter of the seed, together with a little starch, fat, lecithin, and phytocholesterin, and possibly some carbohydrate substance or substances of as yet unknown character. These nonprotein substances are probably not united with one another in the gluten, but are mechanically mixed. The quantity of starch that remains in the gluten depends on the thoroughness of the washing, while the other substances owe their presence largely to their insolubility in water. The chief constituents of the gluten are the two proteids, gliadin and glutenin, the relative proportions of which vary with the variety of wheat from which the flour is made. The character of the gluten and the commercial value of the flour depend to a large extent on the proportion of gliadin to glutenin.

"In the moist gluten these proteins are present combined with about twice their weight of water, which is gradually lost on exposure to dry air or at an elevated temperature.

"The gliadin and glutenin are present as such in the seed and are not, as was formerly supposed, derived from other protein substances through the action of an enzym. This is shown by the fact that they may be obtained directly from the flour by the same treatment as that which yields them from the gluten and under conditions which preclude the action of an enzym."

The characteristics of the different wheat constituents, the products which they yield on hydrolysis, and related questions are also considered and the nutritive value of wheat gluten and other proteins is discussed on the basis of the kind and amount of the cleavage products which they yield on hydrolysis.

"The amount of glutaminic acid which the gluten proteins yield is far greater than that yielded by any of the other food proteins, with the exception of gliadin from rye and hordein from barley. The proteins of the legumes and nuts which are used as food yield from 15 to 20 per cent of glutaminic acid, so that the mean amount of this amino acid from the wheat protein is nearly twice as large. The same also is true of ammonia.

"The proportion of arginin from wheat gluten is relatively small compared with that from most other seed proteins, many of which yield from 10 to 16 per cent of this base.

"The proportion of lysin is likewise small, especially compared with that obtained from the leguminous seeds. The amount of histidin, however, does not differ very greatly from that of the other seed proteins. What significance these differences have in respect to the nutritive value of these different proteins must be determined by future investigation, for it has only very recently been discovered that such differences exist.

"That a molecule of gliadin can have the same nutritive value as one of casein would seem impossible if one molecule of food protein is transformed into one of tissue protein, for in the former lysin is wholly lacking, and glutaminic acid, ammonia, and prolin are in great excess over the amount required to form any of the tissue proteins of which we know. It would seem probable that either the animal requires a variety of food, so that the relative proportion in which the amino acids are available for its use shall correspond more nearly to its requirements, or that only a small part of these amino acids are converted into its tissue proteins and the rest oxidized as such. It is possible that feeding experiments with proteins of known character in respect to the relative proportions of their decomposition products will throw light on these important questions."

The balance of acid-forming and base-forming elements in foods, H. C. Sherman and J. E. Sinclair (*Jour. Biol. Chem., 3 (1907), No. 4, pp. 307–309*).—Food materials differ markedly with respect to the amount of acid which they yield, some supplying to the system an excess of acid-forming and others of base-forming elements. The interest in questions concerned with acidosis led the authors to report some results, obtained in a systematic study which they have undertaken, of the acid-forming and base-forming elements of foods.

Of different methods for computing and expressing results the authors believe it is most satisfactory to calculate the amount of each element found to the corresponding number of cubic centimeters of the normal solution of acid or base. "By then adding together the results obtained for all the base-forming and for all the acid-forming elements, respectively, it is easy to compare the totals and the result obtained shows the excess of acid-forming or of base-forming elements in terms of a familiar standard and in figures of convenient magnitude."

The determinations reported follow:

Excess of acid-forming or base-forming elements per 100 calories in a number of food materials.

Kind of food.	Excess acid, normal solution.	Excess base, normal solution.	Kind of food.	Excess acid, normal solution.	Excess base, normal solution.
	Cc.	*Cc.*		*Cc.*	*Cc.*
Beef, free from visible fat	10.10	----------	Peas	----------	1.94
Oatmeal	3.15	----------	Milk	----------	3.31
Wheat, entire grain	2.62	----------	Prunes	----------	7.92

It is noticeable that peas, in spite of their high protein content, contain an excess of base-forming over acid-forming elements. "Doubtless in most other vegetables this 'potential alkalinity' will be found to be much greater. When a larger number of food materials have been examined it will be possible to compute the extent to which the excess of acid-forming elements in meat and cereal products is offset by that of bases in other food materials or ordinary mixed diets.

"Remembering that the 100 calorie portion of any staple food material may be multiplied many times in a day's dietary it is obvious that, by the free use of meats and breadstuffs on the one hand or of fruits, vegetables and milk on the other, the net excess of acid or base introduced into the body through the food may be varied at will within wide limits. It is not our purpose, however, to discuss the possible physiological applications until the data for a larger number of food materials have been obtained."

Bleaching of flour as now practiced by millers, J. A. WESENER and G. L. TELLER (*Amer. Food Jour., 2 (1907), No. 9, pp. 9–15*).—A large number of samples of flour of different sorts, baking powders, yeast, preserved meats, and salt were examined with reference to the presence of nitrous anhydrid, and data are summarized and discussed regarding the distribution of this body in air, soil, and in animal and vegetable products.

According to the authors, nitrous anhydrid is present in food products made from bleached flours "in less quantities than it is normally present in numerous other articles of food, in parts of the human body, and possibly in parts of every living organism. . . .

"The bleaching of flour does not perpetrate a fraud upon the purchaser, for it does not permit the substituting of an inferior article for a superior one. On the other hand, it does make more suitable for use articles of a superior value which are in a measure otherwise objectionable because of a lack of that finishing step in the process of manufacture which it is the purpose of the bleaching process to bring about."

Endomyces fibuliger, a new ferment organism causing the so-called chalk disease of bread, I. P. LINDNER (*Wchnschr. Brau., 24 (1907), No. 36, pp. 469–474, pls. 2, figs. 88*).—The author identified and studied a micro-organism for which the name *Endomyces fibuliger* is proposed, which, according to his investigations, is the cause of the so-called chalk disease of bread. The reproductions of micro-photographs and other illustrative material show the character and appearance of this micro-organism.

The carbon dioxid value of pure compressed yeast and starch compounds, T. J. BRYAN (*Amer. Food Jour., 2 (1907), No. 10, pp. 22, 23*).—A number of samples of compressed yeast were examined and it was found that the majority of them contained added starch, in general either potato or corn starch, therefore a number of experiments were undertaken to determine whether the addition of starch was desirable. Judging from the amount of carbon dioxid liberated and by baking tests with yeast from 1 to 14 days old better results were obtained with the pure yeast than with that which contained starch. More work is needed, but in the author's opinion the available data are sufficient "to justify the statement that starch in compressed yeast is an adulteration."

Foods (*Mo. Bul. Ind. Bd. Health, 9 (1907), No. 7, pp. 99–108*).—Out of 649 samples of foods examined 27.1 per cent were found to be adulterated. The data reported cover milk, ice cream, butter, prepared meats, summer drinks, and drugs.

Foods (*Mo. Bul. Ind. Bd. Health, 9 (1907), No. 5, pp. 58–73*).—Of 724 samples of beverages, flavoring extracts, leavening products, honey, lard, maple products, meat products, dairy products including ice cream, olive oil, preserved fruits, spices, etc., 16.6 per cent were found to be adulterated.

Supplemental report on canned meats (*Mo. Bul. N. Y. State Dept. Health, 23* (*1907*), *No. 6, pp. 3, 4*).—Of 15 samples of meat products examined 2 were found to contain boron preservatives. Salicylic acid was not found in 5 samples of preserved mince meats.

Experiments on the addition of starch and water to sausage mixtures, A. Kickton (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14* (*1907*), *No. 6, pp. 381–388*).—The investigations have to do with the amount of water retained after cooking by Vienna and similar sausage made with and without starch or other binding material. In general the cooked sausage to which starch or water or both had been added contained noticeably less water than the raw material.

Food analyses, J. T. Willard (*Bul. Kans. Bd. Health, 3* (*1907*), *No. 7, pp. 148, 149*).—Analyses of 6 sorts of cheese are reported.

Complete analysis of tomato fruit, J. M. Albahary (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 2, pp. 131–133*).—The author determined the proximate constituents and the kind and amount of organic acids present in the tomato.

Some Tunisian and Algerian olive oils, L. Archbutt (*Jour. Soc. Chem. Indus., 26* (*1907*), *No. 9, pp. 453–455*).—A paper with discussion in which data are given regarding the iodin value and other analytical constants of a number of samples of olive oil from Tunis and Algeria, the work being undertaken with a view to the detection of adulteration if present.

Horse-chestnut oil, A. Goris and L. Crété (*Compt. Rend. Soc. Biol.* [*Paris*], *62* (*1907*), *No. 3, pp. 117–119*).—According to the authors, the oil present in horse-chestnut seeds is not formed by the action of a ferment. It does not readily dissolve in fat solvents unless the seed has been dried.

The composition of some edible seeds from China, R. W. Langley (*Jour. Amer. Chem. Soc., 29* (*1907*), *No. 10, pp. 1513–1515*).—The seeds analyzed were Chinese lotus (*Nympaea tetragona*), Chinese sweet almond (*Prunus amygdalus*), and gingko nut. Proximate and ash analyses are reported.

Some analyses of Cape wines, J. Lewis (*Agr. Jour. Cape Good Hope, 31* (*1907*), *No. 3, pp. 292–294*).—Analyses of 36 samples of wine are reported and briefly discussed.

Food value of honey as compared with other food stuffs, G. L. Tanzer (*Amer. Bee Jour., 47* (*1907*), *No. 30, pp. 689–691*).—A discussion of the composition of honey and its uses as food.

Selection and preservation of food. Laboratory guide, Isabel Bevier and Anna R. Van Meter (*Boston, 1907, pp. 86*).—This volume, designed as a textbook for students of collegiate grade, contains directions for laboratory work covering 2 semesters. In the first semester emphasis is placed upon the principles governing the selection and preparation of food, and in the second its economic and esthetic value is especially considered.

"The work is based on the supposition that a scientific study of the food problem requires a sufficient knowledge of pure science to appreciate the fundamental processes that underlie the preparation of food. The guide is not in any sense of the term a cook book, neither does it make any claim to originality in recipes. Those used are taken from standard works or formulated to meet a particular need. This work is an attempt to teach the principles of cookery in the same general method as the principles of chemistry are taught, i. e., by a study of different classes of compounds. . . .

"In every case the plan of studying any food is to consider its general aspects in the lecture, its physical and chemical properties in the laboratory, and finally, to show how these influence the preparation of a particular dish."

Register of foods, P. W. Goldsbury (*Boston, 1907*).—A colored chart showing in graphic form the percentage composition of the edible portion of a number of common food stuffs.

Retail prices of food, 1890 to 1906 (*Bur. of Labor [U. S.] Bul. 71, pp. 175-328*).—Statistical data of the retail prices of 30 staple foods secured in the principal industrial centers of the United States in 1906 are reported, discussed, and compared with similar data for preceding years. For the United States as a whole the retail prices of food during 1906 were 2.9 per cent higher than in 1905, and the average cost of food per family in 1906, as determined from 2,567 families in different parts of the country, was $359.53 as compared with $349.27 in 1905.

Food consumption and expenditures for food in Paris, K. A. Wieth-Knudsen (*Rev. Écon. Internat., 3 (1907), No. 3, pp. 570-588*).—A statistical investigation on the amount and character of expenditures for food in Paris. The results are compared with those obtained by earlier investigators.

According to data summarized, food cost 34.8 cts. in 1906-7 as compared with 24.5 cts. per head per day in 1871-1873. The total expenditure for food in 1906-7 was $145.35 per person per year, a value which shows a decided increase over the results of previous investigators.

Restrictions of artificial color in the preparation of food products with specific recommendations, J. Hortvet (*Amer. Food Jour., 2 (1907), No. 8, pp. 40, 41, fig. 1*).—The recommendations which are made are in general that the use of coloring matters should not be permitted in the manufacture of foods which have a distinctive color, but the author believes that harmless colors should be permitted in articles which have no distinctive color.

The effect of coloring matters on some of the digestive enzyms, H. W. Houghton (*Jour. Amer. Chem. Soc., 29 (1907), No. 9, pp. 1351-1357*).—According to the author, annatto when used in the proportions of 1 : 100 to 1 : 1600 is without effect on the peptic digestion of fibrin while it diminishes the enzymic activity on egg albumen and casein.

"Saffron diminishes the enzymic activity on fibrin, casein, and egg albumen when used in proportions varying from 1 : 100 to 1 : 400, while smaller quantities have no effect.

"Turmeric has no effect on the enzymic activity on fibrin when used in proportions of 1 : 800 or smaller, while with casein and egg albumen it diminishes the enzymic activity in each case.

"Cochineal and Bismark brown diminish the enzymic activity on fibrin and casein when used in proportions varying from 1 : 100 to 1 : 400, while with egg albumen the enzymic activity is diminished throughout.

"Croceine scarlet 1-B prevents entirely the enzymic activity on fibrin, while with casein and egg albumen the enzymic activity is prevented when proportions of 1 : 100 to 1 : 200 are used. Smaller quantities of the same dye diminish the enzymic activity on casein and egg albumen."

As regards the effect of annatto and oil yellow on the hydrolysis of butter fat, the data reported showed no retarding action. On the other hand, the action of lipase seemed to be increased owing, in the author's opinion, to the presence of some lipolytically active substance in the coloring matters tested.

The physiological action of some coloring matters and their excretion in the urine, J. Gautrelet and H. Gravellat (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 25, pp. 1467, 1468*).—Brief notes on the behavior of a number of anilin dyes. The colors considered active were methylene blue, methyl violet, eosin, and neutral red. The inactive colors were marine blue and malachite green. The vegetable dyes indigo, carmine, madder, and hematoxylin were also considered inactive.

The effect of meat extract and yeast extracts on the qualitative and quantitative composition of gastric juice, W. Hoffmann and M. Wintgen (*Arch.

Hyg., *61* (*1907*), *No. 3*, *pp. 187–216*, *figs. 3*, *dgms. 8*).—Using a dog operated upon according to the Pawlow method, it was found that the same results as regards stimulation and flow of gastric juice could not be obtained with yeast extract as with meat extract. The physiologically active constituent of meat extract, according to the experimental data, is present in the portion which can be separated by dialysis.

Further observations on the nature of feces fat, J. H. Long and W. A. Johnson (*Jour. Amer. Chem. Soc.*, *29* (*1907*), *No. 8*, *pp. 1214–1220*).—The authors conclude that their experimental data as a whole point to the presence of a lecithin-like body in the crude extract fat of feces. The opinion that feces fat contains no lecithin "probably holds true as far as the larger part of the food lecithin is concerned, but there is every reason to believe that a fraction, and perhaps a large fraction, of that found in the feces does not come from the food but from the bile, as a product of the constant breaking down of cells of the liver."

The fact that the bile of different animals has a high lecithin content has a bearing on the question under consideration and the authors believe that the phosphatic or lecithin bodies of the feces should be regarded as excretory products rather than waste or unabsorbed material from the food. "In pathological conditions the food fat with its small lecithin content may find its way in part into the feces, but in health it is possible that the other source suggested is the more important."

Earlier work has been noted (E. S. R., 18, p. 965).

Observations on body temperature, blood pressure, and alveolar tensions of athletes, L. Hill and M. Flack (*Jour. Physiol.*, *36* (*1907*), *No. 1*, *pp. XI*, *XII*).—In experiments with young men engaged in athletic work it was found that the longer the period the higher the body temperature, the maximum recorded rectal temperature being 105° F. after a 3-mile race. Blood pressure was increased by muscular work, but in all cases rapidly fell to normal or lower as the subjects rested and the panting became less.

"The alveolar air was collected by Haldane's method and the results show that the pulmonary ventilation was more than sufficient to keep normal the alveolar tensions of CO_2 and O_2. It does not appear that the extreme dyspnœa following the race can be caused by increased tension of CO_2 or diminished tension of O_2 in the blood."

Respiratory metabolism in fatigue, O. Porges and E. Přibram (*Biochem. Ztschr.*, *3* (*1907*), *No. 5–6*, *p. 453*; *abs. in Zentbl. Physiol.*, *21* (*1907*), *No. 10*, *p. 328*).—In periods immediately following severe work metabolism is increased and the respiratory quotient is normally low because of the reduction of carbon dioxid. When fatigued the body requires a greater amount of energy for a definite amount of work. The experiments were made with a dog.

Metabolism during starvation. II, Inorganic, E. P. Cathcart and C. E. Fawsitt (*Jour. Physiol.*, *36* (*1907*), *No. 1*, *pp. 27–32*).—In fasting a steady fall in the output of chlorin, phosphoric acid, total sulphur, calcium, and magnesium was noticed from first to last in a period covering 14 days. The output of inorganic sulphates followed total sulphur very closely. The daily output of ethereal sulphates was small, and the output of neutral sulphur fairly regular. Earlier work has been noted (E. S. R., 19, p. 670).

The influence of a one-sided diet or of insufficient food upon the glycogen content of the animal body, E. Pflüger (*Arch. Physiol.* [*Pflüger*], *119* (*1907*), *No. 3–4*, *pp. 117–126*).—From the experimental data reported it seems extremely probable, according to the author, that in fasting the liver continues to form glycogen until the animal dies of starvation. If excessive amounts of either fat or carbohydrates are supplied, the formation of glycogen in the liver ceases or is reduced to a minimum. If, however, the ration consists of an excessive amount of grape sugar, the glycogen formation is greatly increased.

The effect of a meat diet upon the coats of rats, with and without a supply of lime, E. I. Spriggs (*Jour. Physiol., 36* (*1907*), *No. 1, p. XVII*).—The author found that rats fed exclusively on meat had rough and abnormal coats, as had been previously noted, but that when lime is added to the diet the coats "though not absolutely normal are very little affected."

The nutritive value of gelatin. I, Substitution of gelatin for proteid, with maintenance of nitrogen equilibrium at the fasting level, J. R. Murlin (*Amer. Jour. Physiol., 19* (*1907*), *No. 3, pp. 285–313*).—Under certain conditions (supplying a large proportion of the energy of the ration in the form of carbohydrates being especially favorable) it was found possible in experiments with men and dogs to replace part of the proteid nitrogen with gelatin nitrogen.

"The power of the organism to utilize gelatin as a substitute for proteid in maintaining nitrogen equilibrium depends to some extent on the proteid condition of the body at the time of the experiment. The lower this proteid condition becomes the more strongly does the organism lay claim to gelatin as a means of protecting its living substance. Herein appears a biological adaptation of no small importance."

Sugar metabolism, H. McGuigan (*Jour. Biol. Chem., 3* (*1907*), *No. 3, Proc., pp. XXXVII, XXXVIII*).—According to the author, work on the oxidation of sugars in vitro and their metabolism in the body substantiates the clinical assertion that levulose is more easily oxidized than glucose and that it may be used in the body when glucose can not. The order of ease of oxidation of a number of sugars is as follows, levulose being the most easily oxidized: Levulose, galactose, glucose, maltose, and saccharose.

The action of caffein on the capacity for muscular work, W. H. R. Rivers and H. N. Webber (*Jour. Physiol., 36* (*1907*), *No. 1, pp. 33–47, figs. 5*).—The experimental data which they report, according to the authors, confirm the conclusion of previous workers that "caffein produces an increase in the capacity for muscular work, this increase being not due to the various psychical factors which it has been the especial object of our work to exclude. . . .

"It is well known that caffein acts on the isolated neuro-muscular mechanism, and we know from experiments on the capacity for mental work that it has an effect on central activity. The chief interest of our experiments is that they provide definite evidence of the presence of this double action in the case of the capacity for muscular work."

The laws of energy in human physiology, W. Camerer (*Separate from Jahrb. Kinderheilk., 66* (*1906*), *No. 2, pp. 129–187*).—The author has summarized and discussed results and conclusions from German investigations on human nutrition, considering especially experiments on resting, fasting men and animals at different air temperatures, the transformation of energy in proportion to the body surface area, and the influence of bodily activity and diet on the transformation of energy.

ANIMAL PRODUCTION.

Feeding farm animals, T. Shaw (*New York and London, 1907, pp. X+536, pls. 2, figs. 11*).—In this handbook the author discusses live stock and successful farming, principles which govern the selection of farm animals, their food, development, digestion, and assimilation, the characteristics of different food stuffs, meat and milk production, general feeding, and related questions.

The volume as a whole constitutes a useful summary of available data on the feeding, care, and management of farm animals and is designed by the author as the first volume of a proposed series. It has been the author's aim "to prepare a work adapted to the needs of the student and stockman that would succinctly and fully cover the subject of feeding and foods in a general way, by dwelling, first, on the leading principles or laws that govern feeding; second, on type in the animals to be fed and the balancing of foods for them; third, on the foods used in feeding; and fourth, on the more important considerations that apply to successful feeding. It has also been the constant aim to observe that sequence in treatment that would be natural, orderly, and complete; to discuss the subject with a comprehensiveness that would cover conditions in all parts of the United States and Canada and in a manner so simple that any reader may readily understand what is read."

Feed as a source of energy, H. P. Armsby (*Pennsylvania Sta. Bul. 84, pp. 16*).—On the basis of experiments with the respiration calorimeter on the comparative value of different feeding stuffs for steers (E. S. R., 17, p. 380), the author discusses the uses of energy, the fuel value of feed, maintenance requirements, and related questions, the bulletin constituting a popular summary of some of the more important points brought out in the experimental work. According to his summary, the animal uses the energy which it derives from its feed essentially for 3 purposes, namely, maintenance, external work, and the production of human food.

"Even when the animal is apparently at rest, many parts of the bodily machinery are still active, and to maintain this activity requires a supply of energy in the feed. If this is withheld, the animal uses instead energy from the substance of its own body and sooner or later perishes.

"When the demands for maintenance are met, the energy of additional food may be used by the animal to do external work of various sorts, such as pulling or carrying a load, driving a tread power, etc.

"If the animal's feed contains more energy than it needs for its own purposes, it has the capacity of storing up more or less of this surplus energy in the form of meat or fat or milk, and these man uses as food—i. e., as a source of energy for his own body."

Colorado fodders, W. P. Headden (*Colorado Sta. Bul. 124, pp. 105*).—In continuation of previous work (E. S. R., 16, p. 1108) the composition and relative feeding value of alfalfa hay, timothy hay, native mixed hay, saltbush (*Atriplex argentea*), corn fodder, and sorghum fodder were studied. The usual proximate analyses were made, and, in addition, special studies of composition in which the fodders were successively extracted with boiling 80 per cent alcohol, cold water, boiling water, and, after cooling with malt extract, boiling 1 per cent hydrochloric acid solution, boiling 1 per cent sodium hydroxid solution, and lastly with chlorin, the material remaining being washed with 1 per cent sodium hydroxid and sulphurous acid solutions and the residue dried and weighed as cellulose. Digestion experiments with sheep as subjects were also made with each feeding stuff and the feces were treated with the same reagents as the feeds and the digestibility computed on this basis. The urine was not collected.

In tests with alfalfa hay, corn fodder, and saltbush, the heats of combustion of different constituents of foods and feces were determined and in most cases estimations were made of the distribution in the various extracts of sugars, pentosans, methoxyl group, and the amid and proteid nitrogen, together with their respective coefficients.

The data for composition and digestibility are summarized in the following table on the dry matter basis:

Composition and coefficients of digestibility of dry matter of feeding stuffs.

Kind of feed.	80 per cent alcohol extract.	Cold water extract.	Hot water and malt extract.	1 per cent HCl extract.	1 per cent NaOH extract.	Chlorin, etc., extract.	Cellulose.	Energy of total dry matter.	
								Total.	Proportion available.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cal. per lb.*	*Per ct.*
Corn fodder:									
Composition	29.61	4.59	3.24	19.90	13.79	3.55	25.32	4,244	....
Digestibility	73.79	54.16	54.37	69.42	36.27	....	54.00	....	56.00
Alfalfa hay:									
Composition	27.50	8.66	4.37	12.23	16.19	8.76	22.29	4,363	....
Digestibility	73.88	78.89	70.24	60.20	67.72	25.39	52.67	....	62.43
Timothy hay:									
Composition	21.12	6.95	2.98	20.23	17.05	5.71	25.96	4,415	....
Digestibility	61.08	85.06	49.21	60.69	48.52	....	41.61	....	47.83
Native hay:									
Composition	21.50	5.87	2.85	20.80	16.64	5.23	27.11	4,349	....
Digestibility	58.55	73.86	37.69	64.04	32.79	3.28	50.57	....	48.34
Saltbush:									
Composition	22.06	6.94	5.81	19.46	16.71	10.28	18.74	3,886	....
Digestibility	70.49	73.15	73.54	39.87	49.00	6.28	28.97	....	39.16
Sorghum:									
Composition	35.60	4.02	7.55	18.22	11.52	4.45	18.64	3,890	....
Digestibility	81.74	62.86	76.82	48.95	24.85	4.53	47.41	....	55.72

In the author's opinion, the methods which he has followed possess certain advantages, and this question and other matters are taken up in his discussion of the work. He calls attention to the fact that the extract obtained by boiling repeatedly with 80 per cent alcohol is the most important part of the fodder and contains a large, if not the largest, proportion of nitrogenous material and very large quantities of other matters. Since water alone will extract as much as 40 per cent of alfalfa hay the reason why such hay is easily damaged by rain is obvious. The alcoholic extract, including its nitrogenous constituents, is highly digestible and, according to the author's results with the feeding stuffs studied, furnishes the animal with a larger proportion of energy than any of the other constituents. Fairly large proportions of the cellulose residue were found to be digestible, over one-half being assimilated in the case of fodders, which gave good feeding results. The energy which it supplied was also large.

According to the author, while his results do not in any way lessen the value which should be placed on the nitrogenous constituents of fodder, they do show that the value of a fodder depends largely upon the character of its other constituents. The great difference in the value of the 2 fodders—alfalfa and saltbush—is that the former is excellent and the latter poor, owing to differences in the character of the carbohydrates present. In each case the proteids are abundant and well digested.

On alfalfa hay the 3 sheep gained 9 pounds in 5 days. On saltbush there was a loss of 8.5 lbs.

Corn fodder was found to be a satisfactory feed, producing a gain of 3.5 lbs. in the 3 sheep used. Timothy hay, native hay, and sorghum were not studied to the same extent as the other materials. "Of these three, the native hay is the only one on which the lot made a gain. One sheep made a gain of 0.5 lb. on the timothy, but each of the others showed a loss, so that the lot showed a slight loss. . . . The native hay and corn fodder are apparently much more similar than any other two of the six; they gave the same feeding results and both effected it at a comparatively small cost of energy. . . .

"The methoxyl group is present in all of these fodders, but it is not abundant and is digested to only a small extent, as indicated by our results, and whether it plays any part in determining the value of the fodder or not is not apparent."

Colorado fodders, W. P. HEADDEN (*Colorado Sta. Bul. 125, pp. 12*).—A summary and discussion of the results reported in the bulletin noted above.

Commercial feeding stuffs in Pennsylvania in 1906, F. D. FULLER (*Penn. Dept. Agr. Bul. 155, pp. 47*).—Under the provisions of the State pure-food law analyses were made of a number of samples of cotton-seed meal, old and new process linseed meal, flaxseed meal, distillers' grains, brewers' grains, malt sprouts, hominy feed and similar goods, low-grade flour, wheat middlings, bran middlings, wheat bran, wheat bran with admixtures, oat feeds, mixed and proprietary feeds, animal by-products, buckwheat bran, buckwheat middlings, rye middlings, crushed oats, dried-beet pulp, and screenings.

"Nine samples of cotton-seed meal were analyzed, 4 of which were deficient in protein and only 5 could be called 'choice.' Marked deficiencies occurred in the samples of distillers' grains, oat feeds, and certain dairy feeds containing molasses. Several of the manufacturers of proprietary feeds have materially reduced their guaranties on certain products and there is a better agreement between guaranty and analysis.

"Most of the articles offered for sale are properly branded and the disposition of the dealers of the State as well as large milling concerns in the West is to conform to the requirements of the statute.

"Substitution of oat hulls for whole oats is still practiced by several parties and the compounding of mixed feed from wheat bran and ground corn cob is carried on by a few firms, but were it not for the feeding-stuffs law the adulteration of commercial feeding stuffs would be the rule rather than the exception.

"As long as the farmer can raise plenty of corn, hay, and oats he can not afford to purchase any material containing less than 14 per cent of protein."

Cotton-seed meal, J. B. LINDSEY and P. H. SMITH (*Massachusetts Sta. Circ. 1, pp. 8*).—Analyses are reported of 75 samples of cotton-seed meal collected in Massachusetts during the past 3 months. "Sixty-five were guarantied to contain 41 or more per cent protein, and of these 49, or 75 per cent, fell below the guaranty. Of this number, 20 were one-half to 2 per cent below, 12 were 2 to 4 per cent below, 9 were 4 to 6 per cent below, and the remainder more than 6 per cent below the guaranty." Three samples, which were markedly below the guaranty, were, in the authors' opinion, fraudulent.

"Because of heavy rainfalls last autumn large quantities of cotton seed were considerably damaged, and as a result much of the cotton-seed meal that has been offered during the present season has been of off grade, both in color and texture and in chemical composition."

In the authors' opinion, some brokers have endeavored to supply goods of good quality in spite of unfavorable climatic conditions, while other brokers and jobbers have not done so. The need for reliable information and for sounder business methods is insisted upon.

The pentosans of Soja hispida, G. BORGHESANI (*Staz. Sper. Agr. Ital., 40 (1907), No. 2, pp. 118-120*).—The furfurol, pentose, and pentosan content of several sorts of soy beans was determined. The pentosan content ranged from 2.86 to 3.86 per cent and in green soy beans was 3.6 per cent.

Concerning the nutritive value of wheat straw treated with caustic soda under pressure, K. ALTMANNSBERGER (*Ber. Physiol. Lab. u. Vers. Anst. Landw. Inst. Halle, 1907, No. 18, pp. 1-41*).—Straw was treated with sodium hydroxid under pressure to dissolve incrusting substances and the composition and nutritive value of the resulting material were studied.

According to the author, the total ash content was increased by this treatment, while the percentage of silica was diminished. Marked changes were noted in the pentosans, lignin, and cellulose of the crude fiber, acetic and other acids being eventually formed from pentosans and some glucose from the cellulose. Experiments with sheep showed that the digestibility of the crude fiber and ash constituents was materially increased. The straw freed from incrusting substances was readily eaten.

Straw with incrusting substance removed as a feed for farm animals, P. Diffloth (*Jour. Agr. Prat., n. ser., 14 (1907), No. 31, pp. 143–145*).—A summary of data showing the increased value as a feeding stuff of straw from which the incrusting substance has been removed.

Feeding experiments at Pentkowo Experimental Farm, M. Gerlach (*Ber. Versuchsg. Pentkowo, 4 (1904–5), pp. 37–46; abs. in Zentbl. Agr. Chem., 36 (1907), No. 7, pp. 465–470*).—In feeding experiments reported with steers, dried sugar-beet leaves gave somewhat better results than soured beet leaves, and dried beet chips and molasses better results than sugar-beet chips.

In tests with pigs, potato flakes were readily eaten and were nearly as satisfactory as steamed potatoes.

When meat meal, peanut cake, corn, and molasses were compared as the principal feeding stuffs in rations with pigs, the best results, as regards gains in weight and quality of flesh, were obtained with corn supplementing potatoes and skim milk. The least satisfactory results were obtained with the rations in which molasses was fed.

The composition and digestibility of sugar-beet chips and their value as a feeding stuff, F. Honcamp (*Landw. Vers. Stat., 65 (1907), No. 5–6, pp. 381–406*).—In a study of the feeding value of sugar-beet chips digestion experiments were made with sheep, which gave the following average coefficients: Dry matter 86, organic matter 88, protein 60, nitrogen-free extract 94.5, and crude fiber 76 per cent.

From his investigation the author concludes that sugar-beet chips are a satisfactory feeding stuff but that too great reliance must not be placed on this material.

Composition and digestibility of beet chips, F. Honcamp (*Landw. Vers. Stat., 66 (1907), No. 3, p. 256*).—An explanatory note regarding investigations cited above.

Molasses feeding, L. Kuntze (*Bl. Zuckerrübenbau, 14 (1907), No. 19, pp. 300–304*).—A summary of statistical and other data regarding the value of molasses as a feeding stuff for farm animals.

Sugar in the feeding of farm animals (*Bul. École Prat. Agr. Berthonval, 1906, pp. 4–32, dgms. 4*).—In tests with horses 1.5 to 2 kg. of denatured sugar, i. e., sugar to which oil cake has been added, gave satisfactory results as regards maintenance of weight and did not cause digestive disturbances. Satisfactory results were also obtained when denatured sugar was fed to milch cows, pigs, and calves. The author concludes, therefore, that this material, which possesses a pleasing odor and flavor, is a satisfactory feeding stuff and that 1 to 3 kg. per head per day may be fed to horses, 1 to 4 kg. to cattle, and 300 to 500 gm. to sheep and pigs.

Valuable Spanish bean [algeroba beans for horses], B. H. Ridgely (*Mo. Consular and Trade Rpts. [U. S.], 1907, No. 325, p. 168*).—According to the data summarized, the algeroba bean is fed with satisfactory results to horses in southern Spain. "In feeding the beans are broken into halves or quarters and mixed with bran." Some information is given regarding the cultivation of the algeroba tree.

Oats for horse feeding, M. Rasquin (*Jour. Soc. Agr. Brabant et Hainaut, 52 (1907), No. 40, pp. 982–984*).—A summary of data on the importance of oats as a feeding stuff, particular attention being devoted to crushed oats.

The use of prickly pear as cattle fodder (*Cent. Agr. Com. Madras, Bul. 4; abs. in Agr. Jour. India, 2 (1907), No. 3, pp. 304, 305*).—A summary of experimental work, most of which has been carried on in the Madras and Bombay Presidencies, on the value of prickly pears as a cattle fodder. The results are contradictory and it is believed that further investigation is necessary to determine "whether this plant can be satisfactorily fed to all Indian breeds of cattle as a supplement to other food stuffs in time of famine."

Feeding experiments with swine, G. Nannes (*Nord. Mejeri Tidn., 22 (1907), Nos. 37, pp. 435–438; 38, pp. 447, 448*).—The paper gives a report of a feeding experiment with 39 pigs, separated into 9 lots, and fed various mixtures of feeds, viz: Ground oats; ground oats with peanut cake meal; ground oats, peanut cake meal, and molasses feed or "molasin"; gluten feed, ground oats and molasses feed; and germ oil meal and molasses feed, both with and without ground oats. Potatoes were fed to all the lots. The pigs averaged 40 to 55 kg. per head in the different lots at the beginning of the trials, which lasted about 30 days on the average.

The lot fed gluten feed made the highest gains, viz. 0.67 kg. per head per day, while the most profitable results were obtained with the lot fed ground oats and potatoes. The gain per 1,000 kg. live weight for the gluten-feed lots was 17.31 kg. and for the germ-oil-meal lots 14.38 kg., a difference of 20 per cent in favor of the former feed.

Recent experience as to the utilization of kitchen refuse for swine feeding, S. P. Nystedt (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 4–5, pp. 335–350*).—A paper containing a condensed statement of the experience in German, American, and Swedish cities with kitchen refuse as a swine feed. The amount fed ranged from 6 to 10 kg. per head per day. The economic importance of the utilization of this refuse in modern cities is considered.

Experiments at the Proskau Dairy Institute on feeding pigs with starch hydrolyzed with diastasolin, J. Klein (*Deut. Landw. Presse, 34 (1907), No. 80, p. 636*).—In an article quoted from the report of the German Pig Breeders' Association the data summarized show that very nearly the same gains were made on starch treated with diastasolin as on untreated starch and on potato flakes, and the conclusion is reached that in pig feeding skim milk and starch treated with a saccharifying ferment did not give so good results as in calf feeding.

Principles of breeding, E. Davenport (*Boston, New York, Chicago, and London, 1907, pp. XIV+727, figs. 52, dgms. 8*).—In this volume, which discusses variation, causes of variation, transmission, and practical problems with reference to animal breeding, a large amount of information has been summarized, discussed, and made available for the student, and the volume as a whole constitutes a useful handbook for agricultural college and experiment station work and also for the practical breeder of farm animals.

"The general purpose has been first of all to define the problems involved in animal and plant improvement; to free the subject from the prejudice and tradition that have always befogged it; to bring to the study whatever facts are fully known to biological science; to recognize and define somewhat clearly the present limitations of knowledge, and to indicate as well as may be the directions from which further and much-needed light is most likely to come.

Last of all, and more than all, it has been the purpose to encourage, and if possible induce, more exact methods of study and of practice than have hitherto characterized this branch of agricultural science. . . .

"No new theories of evolution are proposed. The chief object has been to distinguish what is known from what is merely traditional; to give as much as possible, within the limits of available space, of the best established facts bearing upon this subject; to call attention to approved methods of study, and to indicate lines of research most likely to furnish valuable information in the not distant future."

The volume also contains an appendix on statistical methods by H. L. Rietz.

Cattle of the Bombay Presidency, F. Joslen (*Dept. Land Rec. and Agr. Bombay, Bul. 26, pp. 69, pls. 65*).—An extended study of the cattle industry in the different districts of the Bombay Presidency. A feature of the work is the large number of illustrations of individual specimens of Indian cattle of different breeds with details of weight and measurements. Available feed supply, methods of feeding, milk yield, and related questions are considered.

The author notes among other things that whole cotton seeds with fibers and cotton adhering are fed. "They seem to have little or no ill effects even when cotton seeds are given in fairly large quantities."

Work oxen in France, P. Diffloth (*Cosmos [Paris], 56 (1907), No. 1183, pp. 355–358; Rev. Sci. [Paris], 5. ser., 8 (1907), No. 16, pp. 504–506*).—The statistics given show that there are approximately 1,333,000 work oxen in France. A study of the efficiency of these animals as compared with work horses indicates that the average ox performs from two-thirds to three-fourths as much labor as the average horse, the exact figures obtained by Ringelmann in such studies varying from 62.5 to 71.7 per cent. The cost of maintenance of a work ox is estimated to vary from 18 to 20 cts. per day where they must be stall fed, and only a few cents where pasturage is abundant. The ox is much less efficient as a roadster than the horse. The cow is much more efficient for this respect than the ox, and it is estimated that 1,500,000 cows are so used in France.

Portable hog houses, J. G. Fuller and C. A. Ocock (*Wisconsin Sta. Bul. 153, pp. 28, figs. 22*).—The author describes in detail the construction of A-shaped and shed-shaped portable hog houses and also discusses the construction of large hog houses on the basis of the station equipment. In the general discussion of the subject, the advantages of portable houses are pointed out.

Control in the hog house, E. V. Johansson (*Nord. Mejeri Tidn., 22 (1907), No. 34, pp. 399–401*).—A plan of control and bookkeeping for swine raising similar to that worked out for dairy tests.

The distribution of stallions in Wisconsin, A. S. Alexander (*Wisconsin Sta. Bul. 155, pp. 172, figs. 14*).—The operation of the Wisconsin stallion law, amendments which have been enacted since the law was passed, and special features of State legislation on this subject are discussed and a summary of data on stallion service legislation in other States presented. Detailed lists are given of the number and breed of stallions in different counties in Wisconsin and a directory of stallions licensed in 1906. The total number of licenses granted to pure-bred stallions and jacks in 1906 was 1,067 and to grade stallions and jacks 1,561, and in 1907 pure breds 219 and grades 413.

Mule raising in Poitou, Hailer (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 16, Sup. 10, pp. 53–65, figs. 7*).—Statistical and other data are given in this general discussion of the Poitou mule industry.

Poultry experiments. Care and management of the flock, J. H. Shepperd and O. W. Dynes (*North Dakota Sta. Bul. 78, pp. 435–474, figs. 13*).—Breeds of poultry, feeding, care, and management of poultry, insect enemies, poultry houses, and related questions are discussed especially from the standpoint of local needs and a preliminary report is made of poultry work carried on at the station.

As regards the relative merits of inside and outside or ground nests for sitting hens, little difference was observed in a 2-year trial, 50 per cent of the eggs in the inside nests and 49 per cent of those in ground nests hatching on an average.

When warm and cold houses were compared, the average monthly egg production in 3 months in a large warmly-built poultry house was 6.5 eggs and in a single board wall colony house 7.6 eggs per hen. In a second test under the same conditions the average egg yield was 6.4 and 10.5 eggs, respectively. In this test "the general health of the fowls in the cold pen was noticeably better than that of the fowls in the warmer pen."

When the comparative effects of inbreeding were studied, 13 out of 26 eggs laid by 3 inbred grade pullets were hatched and 10 out of 24 eggs laid by 4 inbred Barred Plymouth Rock pullets. In each case there were 3 deformed chicks. Twenty-one out of 26 eggs and 22 out of 27 eggs laid respectively by 2 and 3-year old hens and 2 grade pullets (not inbred in either case) hatched and none of the chickens were deformed. For 4 months another record was kept of the egg yield, and it was found that with 4 inbred yearling hens it was 42.5 eggs per hen as compared with an average egg yield of 60 per hen in the case of 3 hens 2 and 3 years old not inbred. "One striking feature in connection with these experiments was the impaired laying ability of the inbred pullets, evidently due to a lack of constitutional vigor. With 2 exceptions they were very erratic in their performances. They would lay heavily at times and then cease almost altogether."

With the object of demonstrating the value of pure-bred males for improving flocks, tests have been carried on for 3 years with satisfactory results with Barred Plymouth Rock cockerels and low grade or scrub hens.

Some poultry problems, J. E. Rice (*Penn. Dept. Agr. Bul. 151, pp. 114–121, pls. 14*).—In a paper presented at the meeting of the Farmers' Annual Normal Institute, 1906, the author discusses problems connected with poultry raising, drawing his illustrative material largely from work carried on at the New York Cornell Experiment Station.

From data summarized regarding egg production at different times of the year he concludes "that egg production is governed by climatic conditions which have to do not only with temperature but with the length of day and with the amount of sunshine," the lowest egg production in the test quoted being noted from October to January and the highest from April to June, inclusive.

In a discussion of the relative value of Barred Plymouth Rock and White Leghorn poultry as table birds data are reported regarding the live and dressed weights, the percentage of organs, cuts, etc., of two birds. "The percentage of the dressed fowl to the live weight in the case of the Rock was 90.5 per cent, while that of the Leghorn is 86.8 per cent. In like manner the percentage of the edible parts of the Rock is 75.49 per cent, and that of the Leghorn 66.55 per cent. Again, the percentage of the waste parts of the Rock is only 13.42 per cent in contrast to 16.45 in the Leghorn."

As shown by studies of the character of the muscular fibers, the lean meat of the Plymouth Rock had a larger proportion than the Leghorn of the muscular fibers which make up the juicy tender meat and a much smaller proportion of the tough connective tissue.

Official report, edited by E. Brown (*Nat. Poultry Conf. Reading Off. Rpt., 2 (1907) pp. XXX+381, pls. 4, fig. 1*).—A report of the proceedings of the second national poultry conference held at University College, Reading, July 8 to 11, 1907, together with the papers and discussions presented at the different sections.

Among the papers on poultry farming and production, breeding, hygiene, and disease, and related topics, may be mentioned The Colony System of Poultry Keeping, by J. H. Robinson; Mendel's Law of Heredity and Its Application to Poultry Breeding, by C. C. Hurst; The Economic Values of External Characters, by L. Vander Snickt; The Production of Milk Chickens, by Mme. Van Schelle; and Methods of Instruction in Poultry Keeping in Great Britain, by F. W. Parton.

In a paper entitled "Hybridization Experiments with the Ceylon Jungle Fowl," by J. L. Thomas (pp. 98–115), experiments are reported in which Ceylon jungle fowl were crossed with common fowl with the object of determining whether these wild birds should be counted as among the ancestors of domestic poultry. The various crosses of pure breds and hybrids were fertile, but, in the author's opinion, additional investigations are needed before the question under consideration can be settled. The paper is followed by a discussion.

Ostrich farming in Cuba, E. V. Morgan (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 2992, p. 15*).—A brief account is given of ostrich raising on a farm in Cuba.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Variations in the amount of casein in cow's milk, E. B. Hart (*Jour. Amer. Chem. Soc., 30 (1908), No. 2, pp. 281–285*).—The author attempted to learn the significance of the variation in the proportions of the quantity of fat to that of casein in the milk of different cows. Data for 26 cows of 5 different breeds are reported and discussed. In the author's opinion: "(1) The relation of casein to fat in cow's milk is a variable one. (2) One of the prime factors controlling its relation is individuality. (3) The relation of casein to fat varies among animals of different breeds and among animals of the same breed. (4) Direct determination of both fat and casein seems necessary in determining the value of the milk of any single cow for cheese production."

The proportion of nitrogenous substances in milk and cream, H. Höft (*Milchw. Zentbl., 3 (1907), No. 12, pp. 521–526*).—The data of the investigations show similar proportions of casein and soluble proteid in milk and cream.

On the combining power of casein with certain acids, J. H. Long (*Jour. Amer. Chem. Soc., 29 (1907), No. 9, pp. 1334–1342*).—The author has previously shown that casein will combine with different alkalis to form salts, and also that the products of casein hydrolysis by peptic digestion combine with hydrochloric acid (E. S. R., 18, p. 910). In the present article an account is given of the behavior of casein toward acid in the absence of pepsin.

At ordinary temperature 1 gm. of casein combined with nearly 7 cc. of one-tenth normal hydrochloric, hydrobromic, hydriodic, sulphuric, and acetic acids. It also combined with tartaric, phosphoric, oxalic, and other acids, for which the numerical values could not be found, but it did not unite with boric acid. With the application of heat the combining power was much greater, due perhaps in part at least to hydrolysis and combination of the resulting products with acid.

"Adsorption" and the behavior of casein in acid solutions, T. B. Robertson (*Jour. Biol. Chem., 4 (1908), No. 1, pp. 35–44*).—The conclusion derived by Van Slyke and Van Slyke, from their investigations on the action of dilute acids upon casein (E. S. R., 19, p. 173), that the taking up of acid from the watery solution by casein is a process of "adsorption" is, according to the author, unwarranted. In his opinion "in the absence of any specific criteria and in the absence of any exhaustive exclusion of other and not less probable physical and chemical possibilities, it may be questioned whether 'adsorption' (or 'mechanical affinity') has yet been proved to exist at all."

The effects of various salts on the coagulation of milk by the ferments of vegetable rennets, C. Gerber and Mlle. S. Ledebt (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), Nos. 14, pp. 577–580; 17, pp. 689–692; 20, pp. 831–833*).—The authors studied the effect of sodium chlorid on the coagulation of raw and boiled milk by the juice of the paper mulberry (*Broussonetia papyrifera*) and that of the fig (*Ficus carica*). They found that the salt in small quantities accelerates the coagulation of the milk, and even causes this phenomenon when the quantity of rennet is too small to act alone. In larger quantity it retards the coagulation of raw milk. It acts towards vegetable rennets as salts of calcium towards animal rennet.

Gerber, continuing the investigation, found that the effect of various other alkali salts is the same as that of sodium chlorid. Sodium fluorid has an accelerating action that is somewhat obscured by the delay in the coagulation of the milk, due to precipitation of the calcium. A method for studying the accelerating power of neutral salts of sodium and potassium is outlined.

The effects of neutral salts of sodium and potassium on the coagulation of cow's milk by vegetable and animal rennets, C. Gerber (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), Nos. 36, pp. 640–644; 38, pp. 738–740*).—The author found that these salts show no exception to the rule observed in previous studies with other salts (see preceding abstract), that a small quantity accelerates and a large quantity retards the coagulating action of vegetable rennet upon cow's milk. In the case of animal rennets these salts were found to retard coagulation whatever the quantity added, the retarding action being more pronounced as the quantity of salt was increased.

Recent investigations on the soluble ferments of milk, A. J. J. Vandevelde (*Nouvelles Recherches sur les Ferments Solubles du Lait. Brussels, 1907, pp. 85+VIII*).—The investigations conducted by the author are described, and the results obtained are discussed together with those of other investigators. The studies reported were concerned with lactoproteolase, lactolipase, salol enzym, and lactochymosine.

According to the author's conclusions, cow's milk does not show the properties of lipase, and possesses in a very feeble degree the faculty of decomposing salol. On the contrary, lactoproteolase and lactochymosine have an actual existence, either as enzym substance or as enzym property. The enzymatic energy seems independent of such conditions as the age of the cow, the quantity of milk produced, or the stage of lactation, except that colostrum in the early stages is very feebly proteolytic. The energy seems dependent only upon special properties of the blood, and varies from one individual to another.

Contribution to our knowledge of the action of rennin, A. H. Moseley and H. G. Chapman (*Proc. Linn. Soc. N. S. Wales, 31 (1906), pts. 3, p. 568; 4, pp. 569–578*).—It was observed that when sodium or potassium hydroxid was added to milk to neutralize the acidity, clotting by rennin was prevented even when the milk was not completely neutralized. From experiments made to ascertain the cause, the authors conclude that the presence of small quantities of alkali lead to the destruction of the rennin through liberation of free hydroxyl ions.

Investigations on the formation of slime in milk, Y. SATO (*Centbl. Bakt. [etc.], 2. Abt., 19 (1907), No. 1-3, pp. 27-40, fig. 1; abs. in Chem. Zentbl., 1907, II, No. 11, p. 935*).—According to the author's investigations, the production of slime in milk by the organism *Diplococcus viscosus*, the characteristics of which he describes, is due neither to transformation of sugar or proteid, nor to swelling of the cell membranes of the bacteria, but to the enormous increase of the slime organisms in favorable nutrient media. Where other observers have found gas produced and transformation of sugar in solutions containing sugar, the slime is due to some other agency than the one studied in these investigations.

On the reductases of cow's milk, E. SELIGMANN (*Ztschr. Hyg. u. Infektionskrank., 58 (1907), No. 1, pp. 1-18*).—The author repeated his former experiments in such manner as to test the conclusions of other investigators which tended to discredit his opinion that the so-called reductases of milk are bacterial products. The results obtained in these later investigations confirm his view.

A study of sour milks, H. G. PIFFARD (*Reprint from N. Y. Med. Jour., 87 (1908), No. 1, pp. 6, pls. 2, fig. 1*).—The author discusses the dietetic and medicinal values of sour milk, explaining the latter as due to destruction of putrefactive organisms in the intestine by lactic-acid bacteria. Several types of sour milk, as kephir, matzoon, and yoghourt, buttermilk, etc., are considered, and the results of examinations of the organisms contained in them are reported.

Experiments with the milk of newly-calved cows, D. A. GILCHRIST (*Jour. Bd. Agr. [London], 14 (1907), No. 9, pp. 520-524, dgm. 1*).—The main object of these experiments was to ascertain the period after calving at which the milk of newly-calved cows may be sold as normal milk. The data reported show variations in the percentages of albumen, casein, and milk sugar in the milk for the first 7 days after calving, but in the author's opinion, "it may fairly be assumed, as a result of these and other investigations, that the milk of newly-calved cows may be used for all ordinary purposes at the end of 3 complete days from calving, provided the milk is then free from blood and is apparently normal."

Influence of stimulating substances on milk secretion, G. FINGERLING (*Landw. Vers. Stat., 67 (1907), No. 3-4, pp. 253-271*).—In these investigations, which are in continuation of those previously reported (E. S. R., 15, p. 605; 16, p. 696), the author studied with goats the effects of oil of fennel seed, common salt, and arsenic on the milk secretion. In accordance with results obtained in the earlier investigations both the former were found to have a favorable influence, but the addition of the arsenic to the ration had practically no effect. The author concluded that only flavoring materials with odor and taste have any influence on secretion by the milk glands.

The composition of cows' milk, R. B. MOUDY (*Ranchman's Reminder, 4 (1907), Nos. 11, pp. 89-92; 12, pp. 98, 99*).—The author studied the milk from 42 cows in five dairy herds, paying special attention to the specific gravity of the milk and the quantities of butter fat and of total solids.

"Of the five herds inspected, the mixed milk of any herd did not run under 3.5 per cent butter fat and 8.5 per cent solids-not-fat. The average of all the milks gives 8.9 per cent solids-not-fat and 13.33 per cent total solids. As far as could be determined, the milk in this vicinity is of the same average composition as in other parts of the world. There were no greater variations than are found elsewhere."

Milk, A. McGill (*Lab. Inland Rev. Dept.* [*Canada*] *Bul. 142, pp. 38*).—The results of inspection of milk for the year 1907 are reported. Of 343 samples examined, 282, or 82 per cent, were found genuine, a larger proportion than at any previous inspection. From a summary of the data recorded in 17 publications of the inland revenue department issued during the past 20 years, the inspector is of the opinion that a standard of 3.5 per cent fat and 12 per cent solids "is a reasonable one and can easily be made by any dairyman who pays proper attention to his herd."

The production and handling of clean milk, K. Winslow (*New York, 1907, pp. 207, pls. 18, figs. 48*).—This book is intended to provide a practical working guide for those concerned in the production and distribution of clean, pure milk. It gives details regarding feeding, housing, and caring for cows, and the handling of milk and cream. The relation of germs to the wholesomeness of milk is considered, and a section of the book devoted to milk inspection includes bacteriological and chemical tests according to recent technique. An appendix describes and illustrates barns, milk houses, utensils, and apparatus, and a scheme for control, supervision, and inspection of city milk supplies is outlined.

Ideal dairying, E. B. Voorhees (*1907, pp. 14*).—At the thirty-third annual meeting of the New Jersey Sanitary Association at Atlantic City, N. J., October 1, 1907, the author presented a discussion of conditions to be considered in the production of clean and healthful milk. In his opinion the question is very largely a commercial one.

The supply of milk for large cities, M. Beau (*Rev. Hyg. et Méd. Infant., 6* (*1907*), *No. 5-6, pp. 530-634*).—The author discusses various facts regarding the production, handling, transportation, and distribution of the milk consumed in large cities in different parts of the world.

Turning cows out in winter, O. J. Iwaschkewitsch, trans. by J. Kaufmann (*Milch Ztg., 36* (*1907*), *No. 49, pp. 579, 580*).—During a period of 10 days in November, in which they were turned out of doors for 3 hours each day, a herd of 80 cows produced on the average per day 1,461 lbs. of milk and 58.8 lbs. of butter, whereas during the preceding 10 days, in which they were kept the entire day in the stall, the same cows produced on the average but 1,349 lbs. of milk per day and 50.6 lbs. of butter. The general health and appetite of the cows was improved by the period out of doors each day, and the author advises dairymen to turn their cattle out in winter time.

Covered milk pails, E. Ujhelyi (*Milchw. Zentbl., 3* (*1907*), *No. 12, pp. 526-532, figs. 2*).—In the average of 10 tests the number of bacteria per gram in milk drawn into a covered pail was less than one-fifth of that in the milk drawn into an open pail. Practically no difference was found in the number of bacteria in milk before and after filtering.

The hygienic character of pasteurizing apparatus for the dairy, H. Weigmann (*Milchw. Zentbl., 3* (*1907*), *No. 12, pp. 538-548, dgms. 5*).—The different reasons for pasteurizing milk are considered and the values of several kinds of pasteurizing apparatus are compared.

Third International Dairy Congress at The Hague, 1907 (*Amsterdam, 1907, pp. 49*).—The conclusions adopted at the final general meeting of the Third International Dairy Congress at The Hague in 1907 are given in French, Dutch, German, and English.

Investigations on dairy science and dairy practice in the year 1907, I. semester, R. W. Raudnitz (*Separate from Monatsschr. Kinderheilk., 6* (*1907*), *No. 6, pp. 43*).—An extensive list of references to the literature of the subject is given, and the important results of the investigations are briefly reviewed.

Report of the dairy bureau, P. M. HARWOOD (*Agr. of Mass., 54 (1906), pp. 281-304*).—The work of the State dairy bureau during the year is summarized.

A suburban dairy farm, J. M. B. CONNOR (*Jour. Dept. Agr. Victoria, 5 (1907), No. 11, pp. 660-664, figs. 3*).—A description of the manner in which 2 acres of ground was so managed as to support 3 cows and a number of chickens, and the receipts from which were nearly $500 over the expenditures.

Farm butter making (*Bd. Agr. and Fisheries [London], Leaflet 192, pp. 8*).—A popular summary of information, in which "it is proposed to consider how and when butter should be made on the farm."

Pure or falsified butter, P. VIETH (*Chem. Ztg., 31 (1907), Nos. 98, pp. 1215-1217; 99, pp. 1230, 1231*).—The difficulties in judging of the purity or falsification of butter from a comparison of analytical data with certain constants are pointed out. Numerous examples are cited, showing that pure butter not infrequently gives a Reichert-Meissl number below 25, the commonly accepted minimum limit. The need of more knowledge regarding the factors affecting the various constants of butter is emphasized.

Camembert cheese, P. BUTTENBERG and F. GUTH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 11, pp. 677-682*).—Analytical data regarding 32 varieties of Camembert cheese are given, with observations regarding the classification of cheese according to fat content, the control of the latter in commerce, and the characteristics of the milk from which the cheese is made.

Kephir and its preparation, I. V. S. STANISLAUS (*Amer. Jour. Pharm., 80 (1908), No. 1, pp. 20-25*).—Three methods of making kephir are described, and the composition of the product is given in comparison with that of the milk from which it is made.

The book of fruit bottling, EDITH BRADLEY and MAY CROOKE (*London and New York, 1907, pp. XVI+99, pls. 10, figs. 10*).—A popular description of apparatus and methods for bottling soft fruits, stone fruits, and vegetables, for making jam, jelly, and marmalade, and of other methods of preserving fruits. Wine and cider making are also discussed. It is intended to meet the needs of those who desire information on the pursuit of these industries in a small way rather than on a commercial scale.

VETERINARY MEDICINE.

Immunochemistry, S. ARRHENIUS, trans. by A. FINKELSTEIN (*Immunochemie. Leipsic, 1907, pp. VI+204, figs. 4*).—This volume contains a series of six lectures delivered at the University of California in support of the chemical theory of immunity. The interrelation of toxins and antitoxins is believed to be a form of chemical neutralization. The subject-matter includes a general discussion of immunity, the rate of reaction of antitoxins to toxins, multiple proportions, neutralization of hemolytic properties and bacterial lysins, neutralization of ricin, saponin, snake poison, etc., hemolysins and precipitins.

Strangeways' veterinary anatomy, edited by I. VAUGHAN (*Chicago, 1907, 8. ed., pp. XXVIII+601, pls. 6, figs. 218*).—This comparative anatomy of the domestic mammals and birds has been revised and brought up to date by the editor.

Meat inspection, V. A. MOORE (*Proc. Ann. Conf. Sanit. Off. N. Y., 6 (1906), pp. 31-44*).—Copies are presented of the recent Federal meat inspection orders. In general the purpose of meat inspection is to guarantee to the consumer the wholesomeness of the meat which he buys. In order to obtain wholesome meat the animal must be free from disease, must be in the proper physiological condition, and the meat must be properly prepared and preserved.

The operation of the meat inspection law, BARTMANN ET AL. (*Landw. Jahrb., 36 (1907), Ergänzungsb. 1, pp. 349–372*).—It appears that the German meat inspection law serves admirably well to furnish consumers with wholesome meat. It increases the cost of meat too much, however, and for that reason it is proposed that the state assume the whole expense of ante-mortem and post-mortem inspections.

The theory of disinfection, T. MADSEN and M. NYMAN (*Ztschr. Hyg. u. Infektionskrank., 57 (1907), No. 3, pp. 388–404*).—Attention is called to the desirability of noting carefully the time and temperature factors in disinfection experiments. It is recommended that in establishing a standard of disinfecting power we should adopt that of corrosive sublimate upon the anthrax bacillus.

Annual report for 1906 of the principal of the Royal Veterinary College, J. McFADYEAN (*Jour. Roy. Agr. Soc. England, 67 (1906), pp. 230–241*).—The author discusses the prevalence of anthrax, glanders, hog cholera, fowl cholera, psorospermosis, and Johne's disease. The last-named disease affects the intestines, is carried in the feces, and is invariably fatal.

Notes from practice, B. A. HJELDE ET AL. (*Norsk Vet. Tidsskr., 19 (1907), No. 9, pp. 195–201*).—A test was made of serum vaccination in an outbreak of swine erysipelas in which 39 out of 40 hogs were completely protected against the disease, while one succumbed. Notes are also given on pulmonary emphysema, *Ascaris megalocephala*, and tuberculosis.

Veterinary notes, L. E. W. BEVAN and E. M. JARVIS (*Rhodesian Agr. Jour., 4 (1907), No. 5, pp. 482–502, pls. 4*).—Much attention has been given to the improvement of pastures for sheep, particularly for the control of parasitic diseases. Complaint is made that sheep sheds are commonly kept in an unsanitary condition.

In preventing infestation with gid worm it is recommended that sheep be quarantined before being admitted to the flock. Infested pastures may be improved by drainage of wet areas, the use of isolation camps for badly affected sheep, and by vermifuge treatment of sheep dogs. Directions are given for administering vermifuges to sheep.

The so-called three-day sickness of cattle may be transmitted to sheep by inoculation. A temperature reaction may be produced by inoculation with virulent blood or nerve tissue.

Infectious diseases and animal plagues in German Southwest Africa, H. JACOBSEN (*Viehseuchen und Herdenkrankheiten in Deutsch-Südwest-Afrika und ihre Bekämpfung. Berlin, 1907, pp. 104*).—A summary is presented of the essential points in the symptoms, pathology, and treatment of anthrax, blackleg, rinderpest, horse disease, morbus maculosus, pneumonia, dog distemper, fowl cholera, strangles, pleuro-pneumonia, malignant catarrhal fever, rabies, glanders, epizootic lymphangitis, contagious vaginitis, Texas fever, East coast fever, equine malaria, scabies, infestation with bots and liver flukes, snake bites, and poisoning with saltpeter, creolin, and *Cotyledon ventricosa*.

Enteritis, CADEAC (*Jour. Méd. Vét. et Zootech., 58 (1907), Sept., pp. 513–523*).—Enteritis is either a partial or general inflammation of the intestinal mucous membrane. If due to bacteria the disease is generalized, but is localized if due to parasites or foreign bodies. Descriptive notes are given on the forms of enteritis caused by staphylococci, streptococci, coli bacillus, and bipolar bacilli. The toxins produced by some of these micro-organisms, particularly bipolar bacilli, may cause serious effects in horses and calves.

Permeability of the walls of the alimentary tract for nonpathogenic bacteria in normal and thirsting animals, HOLLE (*Centbl. Bakt. [etc.], 1. Abt., Orig., 44 (1907), No. 4, pp. 325–332*).—In feeding the potato bacillus to normal and thirsting guinea pigs and rabbits, the walls of the stomach and intestines were found to be permeable to bacteria. After feeding, the latter were found in various organs within a very short time and persisted for long periods. In guinea pigs the bacteria pass through the walls of the stomach and intestines about equally fast, while in rabbits the stomach seems to be more readily permeable than the intestines. Bacteria pass through the walls of the alimentary tract more readily in rabbits which are allowed to thirst than in those which receive green food and plenty of water.

Red lymph glands, Baum (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 34, pp. 477–480, fig. 1*).—In most of our domesticated animals red lymph glands are occasionally found. This condition occurs most frequently in cattle and sheep, rarely in dogs, and perhaps never in the horse. They may occur in all parts of the body, but particularly in the pleural and peritoneal cavities and near the true lymph glands. The size varies from a millet seed to a walnut. These structures may be distinguished from true lymph glands by their possession of a large lymph sinus and by the accumulation of red blood corpuscles in them.

Disintegration of rabies virus in vitro by radium, G. Tizzoni and A. Bongiovanni (*Centbl. Bakt. [etc.], 1. Abt., Orig., 44 (1907), No. 4, pp. 353–360*).—Radium emanations and rays working separately have no effect on rabies virus, but operating simultaneously they produce an effect. Aluminum allows more rays to pass through than any other metal used in the construction of the tubes.

Staining Negri corpuscles, O. Lentz (*Centbl. Bakt. [etc.], 1. Abt., Orig., 44 (1907), No. 4, pp. 374–378, pls. 2*).—Teased preparations of the hippocampus are run through grades of alcohol and stained according to the method of Bohne in eosin and Loeffler's methylene blue.

Transmission of trypanosome infection in intermediate hosts, E. Brumpt (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 26, pp. 176–178*).—A study of trypanosome infection in leeches showed that certain species, particularly *Helobdella algira*, transmit *Trypanosoma inopinatum* to their offspring through the reproductive cells. The trypanosomes invade the egg in an ameboid form, and may be transmitted to frogs by parasitism with leeches. On the other hand the trypanosomes may pass from mother to offspring indefinitely without the intervention of a vertebrate host.

A comparative study of tubercle bacilli of different origin, A. Weber (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 6, pp. 1–14*).—The extensive study and experiments which have been carried out at the German Imperial Health Office on tubercle bacilli obtained from different sources are briefly summarized in the present article.

It appears that distinction should be made between the avian and mammalian forms of tubercle bacilli and that among the mammalian tubercle bacilli, two types, the human and bovine, can be set up as tolerably distinct. No transformation of the avian into the mammalian form has been observed in experiments carried on continuously for two years. Similarly no evidence was secured for the transformation of the human type into the bovine type of tubercle bacilli. As a rule the bovine type of tubercle bacilli in man produces lesions which are largely restricted to the point of entrance and the corresponding lymphatic glands. In some cases, however, a generalized and fatal form of tuberculosis is thus brought about.

Feeding avian tubercle bacilli to hogs and colts, C. Titze (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 6, pp. 215–219*).—Large quantities of tubercle bacilli obtained from fowls were fed to 4 hogs, but in no case was a progressive infection produced. The only result was the appearance of slight changes in the mesenteric and portal lymphatic glands. When excessively large quantities of the tubercle bacilli are fed these organisms multiply to a considerable extent at the point of inoculation and even in the internal organs. In such cases it may be possible to produce a serious toxic effect without the development of the usual progressive form of tuberculosis.

Avian tubercle bacilli were also fed to a colt 6 months old. No tuberculous infection took place. The animal was killed about six months after inoculation and at that time no pathological changes were observed except slight phlegmon and suppuration in the right thigh. The author was unable to find any acid-fast bacilli in the liver and material taken from the mesenteric glands was not infectious for fowls.

Tubercle bacilli of different origin with special reference to tuberculosis of the alimentary and mesenteric glands, A. Weber and M. Taute (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 6, pp. 15-76*).—In the opinion of the authors, conclusive evidence has been obtained that tubercle bacilli of the bovine type may bring about progressive and fatal tuberculous infection in man particularly during childhood. In many cases of tuberculosis in man it is quite impossible to determine whether the tubercle bacilli are of human or bovine origin except by making pure cultures and inoculation experiments with laboratory animals.

The infection of human beings with tubercle bacilli of bovine origin takes place largely in childhood and as a rule is an alimentary infection appearing under the form of primary tuberculosis of the intestinal and mesenteric lymphatic glands and also of the cervical glands. In this group of tuberculous infections in man, tubercle bacilli of bovine origin play a very important rôle and gain entrance to the body largely through the food, particularly cow's milk.

Inoculation experiments with tubercle bacilli of the human type, A. Weber (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 6, pp. 77-87*).—Tubercle bacilli obtained from cases of tuberculosis in man were passed through goats 5 times extending over a period of 284 days, and in another case 8 times during a period of 516 days, through hogs during a period of 300 days and through cattle 4 times during a period of 685 days. During these experiments no change in the virulence of the tubercle bacilli of any of the cultures was observed and the peculiar growth and characteristics of the human tubercle bacilli persisted without alteration.

Studies of surgical cases of tuberculosis, F. Oehlecker (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 6, pp. 88-214, pl. 1, figs. 4*).—In a preliminary comparison of cultures of tubercle bacilli obtained from man and cattle it was found that these two types remain completely distinct when cultivated upon bouillon. In all cases it was possible to distinguish between the two types merely by the habit of growth and without the use of a microscope, or resort to inoculation experiments with animals.

The author carried on a long series of experiments in the inoculation of rabbits with cultures of human tubercle bacilli obtained from surgical cases. It was found that these bacilli when inoculated in doses of moderate size are not capable of producing visible alterations of the lymphatic glands in the region of the point of inoculation. The rabbit, however, is not considered as satisfactory an experimental animal as are cattle for furnishing a sharp distinction in the pathology of the human and bovine tubercle bacilli.

From 50 surgical cases of tuberculosis, the author isolated human tubercle bacilli in 45 and the bovine type in 5 cases. Among these 50 cases 14 were tuberculosis of the cervical glands and in 4 of these cases the tubercle bacilli were of bovine type. During the author's long continued experiments no support was obtained for the belief that bovine tubercle bacilli were more virulent than the human type for human beings.

The detection of bone tuberculosis in food animals, Haffner (*Ztschr. Fleisch u. Milchhyg., 18 (1907), No. 1, pp. 7-12*).—In tuberculosis of the leg bones of pigs the corresponding lymphatic glands are often intact, but if tuberculous alterations are found in the vertebræ there should be strong suspicion that some of the other bones are also affected. In both pigs and cattle, tuberculous bones commonly show no external changes.

The author believes that inspection should be more severe with reference to the detection of bone tuberculosis, but that affected parts may be removed with little loss of meat.

Heredity, portals of entry of infection, and immunity in tuberculosis, M. P. Ravenel (*Proc. Ann. Conf. Sanit. Off. N. Y., 6 (1906), pp. 131-137*).—Heredity is of little or no importance in the spread of tuberculosis. Infection takes place in the respiratory organs in a certain percentage of cases, but too little attention has been given to infection which occurs through the alimentary tract. The author has hopes of the ultimate efficiency of vaccination and other methods for the control of tuberculosis.

Antibodies in tuberculosis and the tuberculin reaction, J. Citron (*Berlin. Klin. Wchnschr., 44 (1907), No. 36, pp. 1135-1141*).—It has been demonstrated that specific agglutinins may appear in the serum and exudates in spontaneous and experimental tuberculosis. In the author's opinion the reaction to tuberculin consists in the multiplication of sessile cell receptors and free antibodies at the focus of infection, after which the latter disappear. In the last stage of the reaction there are numerous fixed cell receptors and free antibodies in the tuberculous foci and in the serum.

In the therapeutic use of tuberculin a general reaction is unnecessary and even harmful while the local reaction is necessary. In the administration of tuberculin the purpose should be to give doses which will stimulate the cells to the fullest extent in the formation of antibodies without passing the toxic limit which results in fever.

The immunity of cattle vaccinated by the von Behring method, A. Eber (*Berlin. Tierärztl. Wchnschr., 1907, No. 37, pp. 671-678*).—Summarizing his own and others' experiments the author concludes that von Behring's vaccination method does not confer upon cattle a satisfactory immunity either toward natural or artificial infection. The method may produce a temporary, slightly increased resistance, but in the vast majority of cases vaccinated cattle are not protected against repeated exposure to tuberculous animals.

It is useless, therefore, to hope for the satisfactory control of tuberculosis by the vaccination method alone, particularly in badly infected localities. In fact further experiments are necessary to determine how far vaccination may be of service in connection with other methods in the control of tuberculosis.

Veterinary notes, E. Almgren (*Svensk Vet. Tidskr., 12 (1907), No. 7, pp. 277-296*).—A detailed description is given of the methods practiced in Copenhagen, Berlin, and Dresden in the study of tuberculosis of mammals and birds. The results thus far obtained in vaccinating cattle against tuberculosis are also discussed.

Vaccinating cattle against tuberculosis, J. F. Heymans and G. Mullie (*Ann. Méd. Vét., 56 (1907), No. 10, pp. 568-578*).—The literature relating to this subject is critically reviewed and the results obtained by the authors are outlined. In view of the immense importance to animal industry and human health of suppressing tuberculosis it is believed that a thorough and conscientious test should be made of vaccination as a means of control.

Diphtheritic vaginitis in cows, W. J. Young (*Vet. Rec., 20 (1907), No. 996, pp. 91, 92*).—The etiology of this disease is unknown. It does not affect heifers under 9 months of age, and is most common in cows in full lactation. Death usually results in a few days. Affected animals should be isolated, and should not be allowed to graze. Treatment may consist in the administration of salines and the use of vaginal douches of potassium permanganate, corrosive sublimate, hydrogen peroxid, etc.

Mammary toxemia or pseudomilk fever, E. R. Smythe (*Vet. Rec., 20 (1907), No. 1001, p. 174*).—Clinical notes are given on 6 cases of a disease which resembled milk fever but which is believed to be the result of toxic poisoning arising from the mammary gland, and appeared to have no connection with the calving period. The disease yielded promptly to the usual treatment for milk fever.

Regulations for facilitating eradication of the Texas fever cattle tick in Lincoln and Claiborne parishes (*Baton Rouge, La.: State Crop Pest Commission, 1907, pp. 12*).—Attention is called to the importance and feasibility of eradicating cattle ticks. A copy is given of regulations adopted by the crop pest commission of Louisiana for the protection of cattle in Lincoln and Claiborne counties against cattle ticks.

The distribution of liquids in the stomachs of cattle, A. Vryburg (*Rec. Méd. Vét., 84 (1907), No. 15, pp. 510–512*).—In text-books of physiology the statement is commonly made that all fluids taken by cattle pass by the rumen into the other compartments of the stomach. The author was led to doubt the truth of this statement on account of the lack of uniformity in the results obtained from the administration of vermifuges. A number of experiments were carried on with calves which received water colored with fuchsin and were killed and examined immediately afterwards. A small quantity of the colored water passed into the digestive stomachs but the most of it remained in the rumen. In the rumen vermifuges become greatly diluted in the large quantity of food present in this part of the stomach and as a result there is little or no effect upon parasitic worms in the other stomachs and intestines. The results are only a little better when the animals are previously fasted.

Poisoning of sheep by Galega officinalis, Moussu and Desaint (*Rec. Méd. Vét., 84 (1907), No. 17, pp. 562–569*).—In a flock of sheep 54 ewes died and 80 others were badly affected as a result of eating *Galega officinalis*. Ecchymoses were found in the walls of the alimentary tract, and a large quantity of serum collected in the pleural cavity in fatal cases. In feeding experiments it was found that 3 kg. of *G. officinalis* was sufficient to kill a sheep. The plant seems not to be poisonous for rabbits.

Pig in health, and how to avoid swine fever, W. Gilbey (*London [1907], pp. 46, pls. 4, figs. 4*).—A discussion is presented of wild swine in England, intelligence of the pig, previous methods of pig raising, breeds of pigs, modern pig raising, breeding, feeding and management, diseases of olden times, and hog cholera.

Hog cholera was not known among native English pigs before 1862. The losses sustained from the disease since 1895 are shown in tabular form. Copies are given of the regulations which have been adopted for its control.

Technical guide to swine plague (*Min. Bl. K. Preuss. Verwalt. Landw., Domänen u. Forsten, 3 (1907), No. 4, Anz. Beilage, pp. 73–78*).—Careful distinction is made between the septicemic and pectoral forms of swine plague. The disease is held to be due to infection with *Bacillus suisepticus*. The septicemic form of swine plague is rare. Swine plague is chiefly characterized by inflammation of the pectoral organs, violent disturbance of the general condition of the animal, and the presence of the specific micro-organism.

A new vaccine for swine plague, C. Nörner (*Württemb. Wchnbl. Landw., 1907, No. 35, pp. 621, 622*).—The symptoms and pathology of swine plague are briefly set forth. The author has had excellent results from the use of suptol in preventing the spread of the disease. Attention is called to the requirement of notification in outbreaks of swine plague.

Muscle tuberculosis in pigs, W. Feuereissen (*Ztschr. Fleisch u. Milchhyg., 18 (1907), No. 1, pp. 12-15, fig. 1*).—A description is given of three cases of tuberculosis of the skeletal musculature in pigs, in which all three pigs were affected with a generalized form of tuberculosis but were in good condition. The tuberculous lesions were caseous and apparently did not contain tubercle bacilli. Musculature containing such lesions is not considered fit for human food.

Tuberculosis of hogs, J. R. Mohler (*Nat. Provisioner, 37 (1907), No. 14, pp. 15, 44*).—Tuberculosis is becoming more prevalent in hogs as a result of feeding them dairy by-products and allowing them to follow tuberculous cattle. Apparently the time is coming when packers will buy hogs only subject to post-mortem inspection.

The composition of the blood of horses of different breeds, V. L. Yakimov and N. Kol (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 7, pp. 563-589*).—The relative proportions of the tissue elements of the blood vary somewhat according to breed, sex, age, season, and time of day. In general the number of red corpuscles is greatest in the thoroughbred.

The entrance of pneumonia micro-organisms into the body of the horse, Walther (*Berlin. Tierärztl. Wchnschr., 1907, No. 35, pp. 635, 636*).—The symptoms of pneumonia in horses are described from numerous cases observed in the practice of the author. It is argued that infection usually enters through the nostrils and cervical lymph glands.

Typho-malaria, L. Teppaz (*Rev. Gén. Méd. Vét., 10 (1907), No. 113-114, pp. 243-251*).—Typho-malaria occurred in the form of an epizootic among army horses and caused the death of 32 horses and 2 mules. Arabian horses seemed to be especially susceptible, while mules were more resistant and asses entirely refractory. The disease appeared only in an acute form. Affected horses were unable to eat or drink, the eyelids and mucous membranes of the mouth became congested, and the body temperature ranged from 38.9 to 41° C. Only 3 cases recovered. Quinin did not lower the temperature in any case and all treatment proved useless.

Tracheal ulceration in glanders, W. Hunting (*Vet. Rec., 20 (1907), No. 996, pp. 90, 91*).—Tracheal ulceration occurs in about 20 per cent of the cases of glanders. Such cases are especially likely to spread infection since virulent bacilli are continually being set free from the ulcers. Ulceration of the trachea is observed in a large proportion of reactors.

Toxic eczema, E. Mouilleron (*Rec. Méd. Vét., 84 (1907), No. 17, pp. 569-575*).—A peculiar form of eczema developed among horses which were fed on a nitrogenous by-product of starch factories, appearing within 8 to 30 days after the ration was adopted. Each horse received 2 kg. of the nitrogenous by-product daily. The trouble was perhaps partly due to molds in the feed, but the author recommends a wider ration to prevent the appearance of eczema.

Pathogeny of bone lesions in the phalanges of the horse, L. Vivien (*Rev. Gén. Méd. Vét., 10 (1907), No. 113-114, pp. 225-243, figs. 9*).—The author presents the results of a macroscopic and microscopic study of traumatic exostosis, coronary osteoarthritis, and similar affections of the phalanges in the horse. Traumatic and other causes of these lesions are discussed.

The treatment of acarid mange, Gmeiner (*Berlin. Tierärztl. Wchnschr., 1907, No. 32, pp. 599, 600*).—The application of ointments containing tar, corrosive sublimate, and other antiparasitic substances is believed to spread the infestation of mites to healthy parts of the dog's skin. Experiments were made with a large number of drugs to overcome this difficulty, a number of dogs being kept under observation for months after treatment. The author thus feels certain of the efficiency of his treatment.

The hair is cut from affected parts of the skin, and a bath of from ½ to 1 per cent of potassium sulphid applied. Affected parts are then rubbed with a mixture containing 1 part oleum carvi, 10 parts alcohol, and 150 parts castor oil. Daily applications of this ointment are made until a cure is affected. The bath in potassium sulphid is repeated once a week.

Demodectic mange of the dog and its treatment, Hébrant and Antoine (*Ann. Méd. Vét., 56 (1907), No. 10, pp. 550–565*).—The symptoms of the various forms of this disease are described. Treatment may be medicinal, surgical, or a mixture of both. In the list of drugs which have been applied mention is made of sulphur and its compounds, sulphate of zinc, iodin, mercury, nitrate of silver, nitric acid, phenol, creolin, soap, oils, turpentine, etc. Hypodermic injections of iodin failed to give entirely satisfactory results.

Treatment of follicular mange, J. Nicolas (*Jour. Méd. Vét. et Zootech., 58 (1907), Sept., pp. 538–541*).—The usual treatments applied for mange are not very effective against the follicular form of the disease. The author had excellent results, however, from hypodermic injections of iodin or a 2 per cent solution of phenol. Decided improvement was shown in 4 days and the hair began to grow on affected parts within 8 days.

The rearing and management of turkeys, with special reference to the blackhead disease, C. Curtice (*Rhode Island Sta. Bul. 123, pp. 64*).—A historical statement is presented regarding the development of knowledge concerning blackhead or enterohepatitis of turkeys. The author describes the parasites, the symptoms and the lesions produced by the disease, and gives notes on the duration of the disease, the susceptibility of young turkeys, transmission, immunity, and treatment. Experiments beginning with 1900 are briefly summarized.

The experimental work reported in the bulletin bears chiefly upon the problem of the transmission of blackhead. It was assumed that the protozoan organism of blackhead was not present in the egg, and that, therefore, if eggs were hatched by common fowls or without contact with turkeys the disease would not develop in the young poults. The attempt to raise turkeys by means of common fowls was a complete failure in so far as avoiding blackhead was concerned. Further experiments indicated clearly that the disease could be avoided if the last few days of incubation was carried on artificially and if the young poults were kept on board floors away from turkeys and common fowls. It appears that the disease may be avoided by removing the turkey eggs from under common fowls or turkeys 3 or 4 days before hatching, wiping them with a cloth moistened in 90 per cent alcohol and finishing them in an incubator. By this means infection with blackhead was reduced from 80 per cent to 20 per cent. The author suggests that the lack of success commonly noted in attempting to raise turkeys in confinement may be due to the fact that they are kept in contact with common fowls.

Further experiments in connection with the blackhead disease in turkeys, C. Curtice (*Rhode Island Sta. Bul. 124, pp. 65–106*).—In 1905 arrangements were made for cooperative experiments between the Bureau of Animal Industry of this Department and the Rhode Island Experiment Station in the further study of blackhead in turkeys. The experiments reported in this bulletin were largely carried out during 1906. In these experiments it was shown that the eggs do not carry the protozoan organism of the disease. Both young and adult turkeys become infected with the disease after being exposed to contaminated surroundings. The young turkeys finally die within twenty-four days after exposure. Ordinary fields not contaminated by fowls of any kind are not infected, but poultry yards are excessively infected.

Common fowls were found to be hosts of the parasitic organism and may spread the disease by means of the feces. Turkeys may be successfully reared to maturity on small areas if the facts just mentioned are borne in mind. Success is most likely to be attained if a sandy or dry soil is selected. No breed of turkeys is immune to blackhead, but the older birds are more resistant than young poults.

Note on a filaria of the red grouse, L. W. Sambon (*Jour. Trop. Med. and Hyg.* [*London*], *10* (*1907*), *No. 18, p. 304, fig. 1*).—In the blood of *Lagopus scoticus* a parasitic worm was found which is described as a new species under the name *Filaria smithi*. At present considerable interest attaches to a study of the diseases of game birds.

An epizootic septicemia among canary birds, Freese (*Deut. Tierärztl. Wchnschr.*, *15* (*1907*), *No. 36, pp. 501–504*).—A dealer in canary birds lost 136 birds in one season from an infectious septicemia. The feathers become ruffled and the eyes are held half shut. The course of the disease is only two or three days. Intestinal mucous membranes become swollen and diffusely reddened, and the liver is hyperemic. The disease may be transmitted to canary birds, sparrows, and mice, but not to chickens, pigeons, rabbits, or guinea pigs.

The period of incubation is three or four days. Apparently the disease is caused by an undescribed species of bacteria. The cultural peculiarities of this organism are described.

RURAL ECONOMICS.

Farm tenancy, a problem in American agriculture, H. C. Price (*Pop. Sci. Mo.*, *72* (*1908*), *No. 1, pp. 40–45, figs. 2*).—By statistics the author shows that the percentage of American farms operated by owners is steadily decreasing, and that tenancy in the last twenty years has risen from 25.5 per cent in 1880 to 35.3 per cent in 1900. This tendency is regarded as detrimental to the agricultural welfare of the country, as it affords an incentive to the average tenant farmer to regard only the present productiveness of the land and to disregard any methods of maintaining soil fertility.

The remedy for this condition is believed to be legislative rather than economic. "Legislation can do something to make it easier to own land than at present. The removal of taxes on mortgaged farms, the establishment of a better credit system, so that money can be borrowed more readily and more cheaply for the purchase of farm lands than is the case at the present time, would greatly add to the ability of young farmers buying their own farms.

"Education that will teach a more rational system of agriculture and a greater appreciation of the possibilities of the farm and farm life will do much to counteract the tendency of farm boys to leave the farm lands that they have inherited to seek employment in the city."

The agricultural laborer: His condition of life, J. Toner (*Irish Gard.*, *2* (*1907*), *No. 21, pp. 202, 203*).—This is a description of the life of farm laborers in Ireland. Attention is called to the improvement in housing accommodations during recent years and to the need of still further aid by public boards and the government in order to enable the farm laborer by proper instruction and guidance in principles of self-help to provide himself and family with an increase in quantity and quality of food supplies, better household facilities, and more homelike surroundings. Improvement along these lines, it is believed, would aid in preventing rural depopulation in Ireland.

[The relations of farm labor in East Prussia], A. HOFFMEISTER and W. KNOBB (*Illus. Landw. Ztg., 27 (1907), Nos. 79, pp. 689, 690, figs. 6; 82, pp. 714, 715, figs. 3*).—These articles discuss the losses and transposition of the population of East Prussia from 1885 to 1905, inclusive.

From 1885 to 1900 the decrease in agricultural population was 84,213, and in 1905, of a total decrease of 33,119 workers, 22,937 or 69.3 per cent belonged to the agricultural classes. The percentage of loss was felt the most on farms ranging from 14 to 28 hectares in extent. Of the decrease in population in 1905, the agricultural parishes lost 89.2 per cent of the total.

Juridical relations between employer and farm servant (*Budapest, 1907, pp. 15*).—This is the text of the law passed in 1907 regulating the relations between employers and contract farm servants in Hungary.

What can the farmer do if his hired man breaks his contract? (*Landw. Wchnschr. Sachsen, 9 (1907), No. 49, pp. 429-431*).—As compared with about 500 cases of breach of contract on the part of farm laborers in Saxony during 1902–1904, it is shown that more than 1,200 were reported for the year 1906. This tendency is regarded as detrimental to agricultural interests. The penalties for such acts are enumerated, and a uniform law throughout Germany is advocated.

The present and future of agricultural cooperation in Piedmont, CASALINI (*Bol. Quind. Soc. Agr. Ital., 12 (1907), No. 22, pp. 991-999*).—This is an address delivered at the national agricultural congress held at Mondovi in September, 1907.

The cooperative associations number 634, of which 143 are mutual credit societies, and the opportunity for growth is shown by a comparison of the ratio of associations to number of inhabitants in Piedmont and Germany. According to the author, Piedmont has the greatest number of landed proprietors in Italy, 197 per 1,000 inhabitants, and is, therefore, the most likely center for the future development of the cooperative movement in Italy. The advantages of cooperation to the owners of small and medium-size farms are pointed out and the results attained are believed to justify the expectation of still greater benefits to all agricultural classes in the future.

Agricultural cooperative societies, J. TRIBONDEAU (*Semaine Agr. [Paris], 26 (1907), No. 1381, pp. 357, 358*).—In this article the opportunities for the further development of agricultural cooperative societies in France are discussed.

It is pointed out that cooperative societies can not now reap any benefits from the fund of 40,000,000 francs advanced by the government to the district banks for the encouragement of agricultural cooperation unless they are affiliated with local mutual credit banks, and this is regarded as a defect in the law which should be amended.

[The friar-lands loan fund] (*Off. Gaz., 5 (1907), No. 45, pp. 777, 778*).—The text of the law appropriating $100,000 as a fund for the promotion and extension of agriculture on the so-called "friar lands" in the Philippine Islands, is reported.

Agricultural cooperative societies, C. BORGES, Jr. (*Bol. Dir. Agr. Bahia, 9 (1907), No. 5, pp. 477-480*).—In continuation of a previous article (E. S. R., 18, p. 786), the author calls attention to the necessity of organizing cooperative societies in Brazil as a means of improving the welfare of the agricultural classes.

Agricultural credit [in Brazil], J. I. TOSTA (*Bol. Dir. Agr. Bahia, 9 (1907), No. 4, pp. 325-334*).—As a conclusion to a previous article (E. S. R., 19, p. 288), the author discusses the organization of Raiffeisen mutual credit societies and points out the advantages of this system of securing credit to farmers with limited capital.

Salvador land law (*Mo. Bul. Internat. Bur. Amer. Repub., 25 (1907), No. 5, pp. 1128-1172*).—The text of the law, promulgated May 13, 1907, relating to the government and control of the agricultural industry in Salvador is reported.

[Agricultural possibilities of California], B. F. Rush and J. A. Filcher (*Rpt. Cal. State Agr. Soc., 1906, pp. 230*).—This report contains numerous articles relating to the opportunities the State affords for the establishment of rural homes and the most important branches of agriculture, and furnishes detailed statistics by counties of the agricultural production in 1905–6.

Agriculture of the States of Oregon, Washington, and Idaho for the year 1906, Laidlaw (*Diplo. and Cons. Rpts. [London], Ann. Ser., 1907, No. 3933, pp. 9*).—Statistics on lands available for settlement, principal crops raised, and the condition of dairy and stock farming in these States are tabulated and discussed.

Cotton movement and fluctuation, 1902–1907 (*New York, 1907, pp. 190, pls. 5*).—This publication contains detailed statistics and special articles relating to cotton production, manufacture, and prices in the chief markets of the world, but particularly with reference to the cotton industry in the United States. A summary of the cotton industry in the United States for the year ended August 31, 1907, shows a total production of 13,550,760 bales, an export trade of 8,527,228 bales, spinners' takings in this country 5,195,750 bales, and stock on hand 276,844 bales.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 2, pp. 9-16*).—In addition to the usual data on the condition of crops in the United States and foreign countries and the yields, value, and prices of agricultural products, the numbers and values of farm animals on January 1, 1908, a summary of the trade in farm and forest products for 1906 and 1907, and the numbers, values, imports, and exports of horses from 1888–1907 are reported.

The agricultural census of Austria from June 3, 1902, F. R. von Juraschek and W. Schiff (*Österr. Statis., 83 (1907), No. 4, pp. 105*).—Complete agricultural returns for the provinces of Bohemia, Moravia, and Silesia as part of the government census previously noted (E. S. R., 19, p. 388).

Agricultural statistics [of Belgium] in 1906 (*Statis. Belg. Recense. Agr., 1906, pp. 261*).—The condition of agriculture in the different provinces during the year is discussed, and detailed statistical data relating to the acreage and yields of crops, number of live stock, quantities of fertilizers used, etc., are reported.

[Agriculture in Queensland], T. Weedon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1906-7, pp. 174*).—Detailed information regarding the condition of agriculture and statistics of crop production and live stock are reported for the year ended June 30, 1907. A scarcity of skilled farm labor is noted.

Agricultural statistics of Eastern Bengal and Assam for the year 1905–6 (*Agr. Statis. East. Bengal and Assam, 1905-6, pp. 31*).—General returns showing total acreage of lands, classification of areas, acreage in crops, population, and land transfers are reported.

Season and crop report of Bengal for the year 1906–7, C. A. Oldham (*Season and Crop Rpt. Bengal, 1906-7, pp. 3+XX*).—Notes are given on the agricultural conditions in the province during the year, and statistical data on the rainfall, classification of areas, acreage, yields, and prices of the principal crops, number of agricultural stock, implements, etc., are reported.

Agricultural statistics of India for the years 1901–2 to 1905–6 (*Agr. Statis. India. 22 (1901-1906), I, pp. III+429; II, pp. II+90*).—Volume 1 gives complete returns, as far as they could be secured, of the acreage and yields of crops, number of live stock and implements, transfers of land, and other data relating to agriculture for British India, and volume 2 similar data for the native states.

AGRICULTURAL EDUCATION.

Agricultural education including nature study and school gardens, J. R. Jewell (*Bur. of Ed. [U. S.], 1907, Bul. 2, pp. 140*).—This bulletin presents an unusually comprehensive account of the provisions for instruction in agriculture and related subjects in the United States and foreign countries, but with especial reference to conditions in North America. The author has endeavored to give a good general idea of the present status of agricultural education of different grades, and has also discussed at some length the advantages of agricultural education. The bulletin contains a bibliography of 123 references and an appendix containing a form employed in the Province of Nova Scotia for the recording of nature observations by school children.

Earning while learning to earn, F. H. Hall (*School News and Pract. Ed., 21 (1907), No. 3, pp. 129, 130*). This is an argument against "taking a young man out of useful activity for 4, 6, or 8 years to get him ready for useful activity," and in favor of applying to agricultural college courses the plan inaugurated by the University of Cincinnati in the College of Engineering in 1906 which involves cooperation with large mechanical and electrical manufacturing companies in Cincinnati and vicinity. Each of the cooperating firms permits students in pairs to pursue 6-year engineering courses at the university during alternate weeks, one student of each pair being in turn in the university a week while the other is in the factory. This alternation goes on during the eight and one half months of the university year, and during the remainder of the year all student apprentices are employed constantly at the factory.

The writer asks if it is not possible and practicable to arrange a somewhat similar scheme whereby students will be able to earn their way through college and at the same time secure a better training in the practice of agriculture than at present.

Training at the new State School of Agriculture at St. Lawrence University, K. C. Davis (*Cornell Countryman, 5 (1907), No. 2, pp. 40, 41*).—A description of the subjects taught in the curriculum of this school with special reference to agriculture and domestic science.

Report of the agricultural section of the University of Montevideo, A. Backhaus and J. V. Diaz (*Rev. Secc. Agron. Univ. Montevideo, 1907, No. 1, pp. 283, pl. 1, figs. 7, plan 1*).—This report includes among other things a plan and description of the experimental field of the university, an account of the establishment, organization, and work of the agricultural section of the university, addresses at the laying of the cornerstone in February, 1906, and detailed programmes for the work in the following courses: Rural economy, general and agricultural chemistry, botany and vegetable pathology, general technology and agricultural industry, agriculture, rural engineering and surveying, climatology and meteorology, and political economy.

The new Royal Imperial Agricultural, Educational, and Research Institute at Spalato, K. Ehrmann (*Land u. Forstw. Unterrichts Ztg., 20 (1906), No. 3-4, pp. 217-235, fig. 1*).—This is a description of the reorganized Agricultural Chemical Experiment Station at Spalato, dealing with the buildings and equipment of the institute, the rules governing it and the practical and theoretical instruction, and giving the course of study in considerable detail.

Doctor Robertson's work for the training of Canadian farmers, G. Iles (*Amer. Mo. Rev. of Reviews, 36 (1907), No. 214, pp. 576-584, figs. 9*).—A brief biographical sketch of Dr. J. W. Robertson is followed by an account of his connection with the "Macdonald movement" and a description of the different institutions aided or built up by Sir William Macdonald, including consolidated schools, a training school for teachers at Guelph, and Macdonald College at Ste. Anne de Bellevue.

Agricultural instruction [Chile] (*Ofic. Cent. Estad., Sinópsis Estad. i Jeogr. Chile, 1905, pp. 219–222*).—Information is given concerning the organization, courses of study, income, students, and other matters of interest for the Agricultural Institute, Santiago, and the following practical schools: Practical School of Agriculture, Santiago; Practical School of Viticulture and Viniculture, Cauquenes; School of General Agriculture and Animal Industry, Chillan; School of General Agriculture and Forestry, Concepcion School of Tillage, Animal Breeding, and Agronomy, Ancud; and the Practical School of Agriculture, Temuco.

Teaching agriculture in the common schools, A. D. McNair (*Farm and Ranch, 26 (1907), No. 42, p. 2*).—An answer to the objection to teaching agriculture in the common schools on the ground that the subject is a technical one, with suggestions for simple work in agriculture to be undertaken.

Programme of experimental science, drawing, manual instruction, and domestic economy for day secondary schools (*Dept. Agr. and Tech. Instr. Ireland Circ., 1907–8, pp. 12*).

Home nature-study course, Anna B. Comstock and J. W. Spencer (*Home Nature-Study Course [Cornell Univ., State Col. Agr.], n. ser., 4 (1907), No. 1, pp. 36, figs. 15*).—Suggestions are given for the fall work of third-year pupils as outlined in the Syllabus of Nature Study and Agriculture issued by the New York State Education Department. There are lessons on birds, corn, pumpkins, turtles, Monarch butterfly, horse-chestnut, and the dahlia, with a supplementary article by J. W. Spencer on the planting of fall bulbs.

How to read the weather map, J. W. Smith (*Agr. Col. Ext. Bul. [Ohio State Univ.], 3 (1907), No. 3, pp. 5–13, charts 6*).—This is a description of the work of the Weather Bureau with reference to gathering data for weather maps and the making of the maps, and an interpretation of the arrows, lines, and other symbols used. The article is suitable for study in the public schools.

Nebraska boys' and girls' associations—Organization, E. C. Bishop (*Univ. Nebr. Bul., 12. ser., No. 25, pp. 3–22, figs. 2, dgm. 1*).—Conditions governing entries and the judging of exhibits are given, together with the programme of the meeting.

Selecting corn for the contest, V. Keyser (*Univ. Nebr. Bul., 12. ser., No. 25, pp. 22–32, figs. 2*).—Directions are given for selecting, storing, packing, and shipping the corn for exhibits.

Nebraska farmers' institutes, E. A. Burnett and V. Keyser (*Univ. Nebr. Bul., 12. ser., No. 22, pp. 27, figs. 4*).—This bulletin contains suggestions for organizing and conducting farmers' institutes and descriptions of new features which the department of farmers' institutes in Nebraska is introducing into the work this year. There are suggestions concerning the organization of local farmers' institutes, local support for farmers' institutes, local management, stock and judging demonstrations, exhibits of farm products, women's work, boys' and girls' contests, and the evening session. A brief report is given of the farmers' institute conference at Lincoln, January 18, 1907, and of the farmers' institute work during the winter of 1907.

Addresses delivered at the meetings of the Council of Agriculture during the first vice-presidency by H. C. Plunkett (*Dublin: Dept. Agr. and Tech. Instr. Ireland, 1907, pp. 122*).—In this pamphlet are collected the 11 addresses delivered by the vice-president of the Department of Agriculture and Technical Instruction for Ireland before the Council of Agriculture between 1900 and 1907 on various phases of the educational and other work of the department.

Elementary agriculture, K. L. HATCH and J. A. HASELWOOD (*Chicago, 1907, pp. 198, pl. 1, figs. 44, dgms. 5*).—This is a revision of the text-book of elementary agriculture previously noted (E. S. R., 18, p. 294).

A secondary course in agronomy (*U. S. Dept. Agr., Office Expt. Stas. Circ. 77, pp. 43*).—The manuscript for this circular was prepared by G. F. Warren, of Cornell University, for the committee on instruction in agriculture of the Association of American Agricultural Colleges and Experiment Stations. It contains a syllabus on agronomy for secondary instruction, a detailed outline for the study of wheat, instructions to teachers, and outlines for 113 lectures, recitations, demonstrations, and laboratory exercises on phases of agronomy concerning which there is now available material suitable for use in the recitation and the practicum. These cover in a general way the study of plants and their environment, and in a more particular way leguminous crops, corn, grasses, wheat, and cotton. There are also lessons on the home garden, the propagation of plants, insect enemies and diseases of plants, spraying solutions, bacteria and molds, forestry, farm buildings and roads, and other topics.

Simple exercises illustrating some applications of chemistry to agriculture, K. L. HATCH (*U. S. Dept. Agr., Office Expt. Stas. Bul. 195, pp. 22, figs. 5*).—This bulletin contains 28 exercises intended to illustrate in a very simple way those elements and compounds called plant foods which are essential to the growth and development of the plant, compounds formed by the plant out of the food which it consumes, the sources of plant food, and the meaning and importance of acids and alkalis.

Proceedings of the twenty-first annual meeting of the Association of American Agricultural Colleges and Experiment Stations, held at Lansing, Mich., May 28–30, 1907, edited by A. C. TRUE, W. H. BEAL, and H. C. WHITE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 196, pp. 114*).—An account of this convention has been given (E. S. R., 18, pp. 1007-1018).

NOTES.

Arkansas University and Station.—G. A. Cole, professor of agriculture and agriculturist, has resigned and has been succeeded by R. J. Nelson, formerly field agent in charge of branch stations.

California Station.—A special farmers' institute was held March 17-20, at Whittier, to celebrate the opening of the Southern California Pathological Laboratory.

Connecticut College.—C. L. Beach, of the University of Vermont, has been elected president, vice R. W. Stimson, whose resignation has been previously noted.

Connecticut State Station.—K. G. MacKenzie has resigned as chemist.

Delaware College and Station.—Firman Thompson has been elected professor of agricultural chemistry in the college and chemist in the station, and is expected to begin his work July 1. A two-weeks' winter course in agriculture had an enrollment of 40 students, which was four times that of any previous year.

Illinois University and Station.—Through a State appropriation of $50,000 annually for the current biennium, the graduate school which has been maintained for some years has been put on a definite footing. According to a note in *Science* this is "the first time in the history of American education that the people in their corporate capacity have put themselves on record as definitely in favor of [graduate work]." The formal opening of the school took place February 4 and 5. The opening address was by President G. Stanley Hall, of Clark University, who called attention to the immense sums that the National Government has spent for investigation, and to the results of the greatest practical importance that have followed. In his opinion original research was a profitable investment. The assertion that the State universities should not and could not undertake graduate work he considered untenable.

Herman Dorner, assistant professor of botany in Wabash College, has been appointed instructor in floriculture in the college of agriculture.

Kansas College and Station.—The resignations of President E. R. Nichols and Director C. W. Burkett have been accepted, to take effect, respectively, July 1, 1909, and September 1, 1908. Professor Burkett has, according to press reports, accepted an editorial position on the *American Agriculturist*. J. L. Pelham, assistant in horticulture at the Fort Hays Substation, resigned March 1 to become instructor in agriculture at the Western Kansas Normal School, and his duties have been assumed by L. E. Hazen in addition to his previous work as special agent in charge of cooperative experiments. Recent appointments include Earl Brintnall as assistant in dairying, and E. L. Sieber as assistant in chemistry. H. F. Roberts is to sail for Europe in May for a summer's inspection of the wheat regions of central and southern Europe. It is hoped to secure superior strains of hard wheats for introduction.

Kentucky University.—Through an act of the State legislature, the name of the Agricultural and Mechanical College of Kentucky has been changed to Kentucky State University, and the institution has been definitely correlated with the public school system of the State. An appropriation of $200,000 was granted for new buildings, and a permanent appropriation of $20,000 for maintenance.

Louisiana Stations.—Experiments in rice growing will again be conducted at Crowley in cooperation with the Bureau of Plant Industry of this Department, and C. E. Sellers has been selected to take charge of the work. Through the efforts of Director W. R. Dodson the first boys' corn club of the State has been organized at Avoyelles Parish, with an initial membership of more than 190 boys. Great enthusiasm is being manifested for the contests that are to take place at the parish fairs in the fall, at which time suitable prizes will be given for the best exhibits.

Maryland College.—Jerome J. Morgan has resigned as assistant professor of chemistry to accept a position with the Bureau of Chemistry of this Department.

Massachusetts College and Station.—A bequest of $6,000 has been made to the college through the will of Mrs. Louisa S. Baker, late a resident of Amherst, the income of which is to be used to help deserving students. A successful farmers' institute was held at the college at the close of the short winter course, with an attendance of 300. Parley A. Russell has been succeeded on the board of trustees and its committee on the station by Hon. W. W. Rawson, of Arlington, well known as a market gardener and seedsman.

Michigan College and Station.—Director C. D. Smith has resigned to accept the presidency of the Louis Queiros School of Agriculture of São Paulo, near Piracicaba, Brazil, and sailed for that country early in April. He is succeeded by R. S. Shaw, who as previously announced is also dean of the departments of agriculture, veterinary science, horticulture, and forestry in the college. Dr. C. E. Marshall has been made vice-director and is to have immediate charge of the scientific investigations, particularly those carried on under the Adams Act. The college has established a department of agricultural education, with W. H. French, now deputy State superintendent of public instruction, as its head, his duties to begin about July 1. Professor French has been actively engaged in his present position in promoting the interests of agricultural education, and an effort is to be made to introduce agriculture into several high schools of the State.

Missouri Station.—L. F. Childers, assistant in agronomy, has resigned to accept the professorship of agriculture in the State Normal School at Maryville. Frank Agrelius, a graduate of the University of Kansas, has been appointed assistant in botany and has entered upon his duties.

Nebraska University.—A correspondence course in nature study has been announced, to include lessons concerning common trees, seedlings and elementary plant culture, common seed plants including weeds, some groups of flowerless plants, domestic animals, common birds, the important groups of insects with the life histories of a few types, the silkworm, toad and frog, soils and their relations to plants and animals, elementary meteorology, nature-study literature, and courses of study for schools. By matriculating regularly in the university students who complete this correspondence course can secure university credit.

New Jersey College and Stations.—George A. Billings has resigned as dairy husbandman in the station to accept a position in connection with the Farm Management Investigations of this Department. F. C. Minkler, animal husbandman, is to assume charge of the dairy husbandry work with the assistance of W. W. Shute as farm foreman. John Gaub has been appointed assistant chemist.

Cornell University and Station.—S. H. Gage, professor of histology and embryology, will retire from teaching at the close of the present academic year to devote himself to research. Dr. James Law, director of the New York Veterinary College, will retire under the provisions of the Carnegie Foundation for the Advancement of Teaching, and will be succeeded by Dr. V. A. Moore, professor of comparative pathology. A. R. Mann has been appointed an assistant in the dairy department, and will give special attention to certain phases of extension work in dairy industry.

The State Agricultural Experimenters' League has arranged for cooperative and demonstration work during the current season by members of the university and station staff in agronomy, plant selection and breeding, horticulture, entomology, animal husbandry, poultry husbandry, dairy industry, plant diseases, soils, and experimental agronomy.

New York State Station.—Willis G. Johnson, recently appointed to the board of control, died March 11, at the age of 41 years. Professor Johnson was graduated from Cornell University in 1892, receiving the A. M. degree in 1894 from Leland Stanford University, where he was for two years instructor in entomology and embryology. From 1894 to 1896 he was assistant to the State entomologist of Illinois, and in the latter year became the head of the department of entomology in the Maryland college and station and State entomologist, resigning in 1900 to accept the associate editorship of *American Agriculturist*, which position he occupied at the time of his death.

H. E. Hodgkiss has reentered the station service as assistant entomologist.

North Carolina College and Station.—C. L. Newman, of the South Carolina college and station, has been elected professor of agriculture. The station has operated a corn special train over the lines of the Norfolk & Southern Railway, in the eastern part of the State, the trip extending from March 22 to April 1. Stops of two hours or more were made at 20 villages and towns, besides several evening talks on general agricultural and educational topics. The smallest attendance at any stop was 40, and the average about 150. Attached to the train was an exhibition car which carried sample ears of about 50 varieties of corn which the station has been testing cooperatively for several years, besides samples of varieties of oats, wheat, and cowpeas, typical soils of the State, the chief insects and plant diseases, and spraying mixtures and apparatus. The speakers included Director Williams, the entomologist and the biologist of the station and the veterinarian and animal husbandman of the State department of agriculture.

Ohio University and Station.—Dr. W. A. Kellerman, professor of botany in the university since 1891, died March 8 at Zacapa, Guatemala, after a brief attack of malarial fever. At the time of his death he was in charge of a party engaged in the study of Guatemalan flora, in which he was a recognized authority. Doctor Kellerman was born May 1, 1850, graduated from Cornell University in 1874, and received the Ph. D. degree from the University of Zurich in 1881. His service as a teacher included, in addition to his work in Ohio, five years at the Wisconsin State Normal School and eight years at the Kansas college, four years of which he was also State botanist and botanist of the Kansas Station. Doctor Kellerman was founder and editor of the *Journal of Mycology*, and the author of Flora of Kansas, Elementary Botany, Phyto-Theca, Spring Flora of Ohio, and a large number of shorter articles.

The new buildings for the colllege of agriculture were dedicated in February, the State Live Stock Association participating in the exercises. The speakers included President W. O. Thompson, Governor A. L. Harris, and O. E. Bradfute of the board of trustees. The dedicatory address was by Director T. F. Hunt of the Pennsylvania Station, who took for his subject The Relation of Domestic Animals to Human Progress. The buildings consist of a judging pavilion costing $20,000, a dairy and beef cattle barn costing $33,000, and a horse barn costing $22,000. The judging pavilion contains a two and one-half story front with lecture rooms and offices, and a main judging room 112 ft. long with a seating capacity of 300, and so divided that three classes may use it simultaneously.

George E. Scott, of Mount Pleasant, has been appointed to the board of control of the station, vice T. C. Laylin, and the board has organized for the ensuing year by the election of John Courtright as president, D. L. Sampson as secretary, and C. W. Montgomery as treasurer. The station is seeking an appropriation from the legislature of $11,350 for the inauguration of extension work in dairying, and is also asking for funds for building a dairy barn, equipping it with stock, and employing an assistant in dairy husbandry.

Pennsylvania College and Station.—Dr. Edwin Erle Sparks, professor of American history in the University of Chicago and dean of the university college, has been elected president of the college to take effect in June. R. L. Watts, a graduate of the college in 1890 and a successful vegetable gardener and fruit grower of the State, has been elected professor of horticulture, vice George C. Butz, deceased. A. W. Broomell, assistant chemist in the station, has resigned to accept a position with the division of feeding-stuffs control of the State department of agriculture.

An enthusiastic farmers' week held by the school of agriculture and the station early in January attracted 336 people representing 50 counties of the State, and was regarded as of great service in popularizing the work of the school and station.

Rhode Island College.—W. E. Drake, who has been at the head of the mechanical engineering department for about sixteen years, has tendered his resignation to take effect in June. The college is asking the general assembly for an appropriation of $75,000. It is desired to erect a new building to serve as a dormitory, dining hall, and assembly room, and to make certain alterations in two of the present buildings to fit them to meet the demands of the increased attendance.

South Carolina College and Station.—A plan of reorganization of the college and station work has been adopted by the board of trustees under which the work of each will be differentiated to a much greater extent than at present. Under this plan the personnel of the station will comprise J. N. Harper as director and agriculturist, C. C. Newman as horticulturist and plant breeder, A. F. Conradi as entomologist, H. W. Barre as plant pathologist, in addition to an animal husbandman, a chemist, a farm foreman, and the clerical staff. The instruction force in agriculture in the college will include an entirely distinct corps of men, organized as a director and professor of agriculture, a professor of animal husbandry, a professor of geology and mineralogy, a professor of botany and forestry, a professor of veterinary science who will be in charge of State inspection work, a professor of horticulture and entomology, an assistant professor of agriculture, and an assistant in veterinary science and the State inspection work. Under this arrangement 8 men will devote their entire time to teaching and 6 men exclusively to station work, with each division in charge of a director.

The college has established in its department of textile industry a permanent school of cotton grading. The course extends six weeks, and is designed for the training of experts in handling and marketing cotton. A number of men have already completed the course and are now engaged under the auspices of the Farmers' Union in assisting farmers to market their crop.

Virginia College.—A two-year secondary course in agriculture has been arranged and will be offered for the first time at the beginning of the next college year.

Washington Station.—A special farming demonstration train was run through Whitman County on March 5 and 6, with one-hour stops at 14 towns. Over 2,800 people visited the train, examined the exhibits, and listened to lectures by members of the station staff on improved methods of farming. A special fruit demonstration train was also sent out over the lines of an electric railway in eastern Washington, March 27-28, with 30-minute stops at 20 towns, and an attendance of about 1,900 fruit growers. Lectures and demonstrations were given on methods of combating the codling moth and apple scab, and on orchard cultivation. It is believed that this is the first fruit demonstration train ever operated, and also the first electric train to be used for demonstration purposes. The results of the trip are regarded as highly satisfactory, and the work is meeting with the hearty approval of the farmers of the State.

Wisconsin University.—The university extension division is aiding in the organization of clubs among farmers for the study and discussion of topics of the day. Subjects are furnished for discussion, together with outlines of programmes and material for debates. The State board of agriculture, the State bureau of labor and industrial statistics, the State forester, the State free library commission, all departments of the university and station, and the State experiment association are cooperating in the undertaking.

Wyoming University and Station.—Ground has been broken and work is rapidly proceeding for the construction of a $25,000 woman's building, designed to furnish laboratories and class rooms for the domestic science department as well as dormitory accommodations. Plans are being perfected to drain the 320-acre farm belonging to the university, which is now practically useless by reason of the large quantity of seepage water which has impregnated the soil with alkali coming from irrigated land above.

The station has just received an importation from England of four Kerryhill sheep, including one ram and three ewes for use, together with the 15 other breeds now in the possession of the institution, in the sheep and wool investigations.

Press reports announce the retirement of President Frederick M. Tisdel. J. D. Towar, director of the station, is acting president.

International Institute of Agriculture.—George K. Holmes, chief of the Division of Foreign Markets of the Bureau of Statistics, has been designated as the representative of this Department at the spring meeting of the Institute at Rome.

International Congress for the Repression of Adulteration of Alimentary and Pharmaceutical Products.—Through the initiative of the Universal Society of the Geneva White Cross and the Fourteenth International Congress of Hygiene and Demography, plans have been perfected for the First International Congress for the Repression of Adulteration of Alimentary and Pharmaceutical Products, to be held in Geneva in September, 1908. An exhibition of unadulterated products will be held in connection with the Congress, the chief business of which will be the formulating of definitions with a view to establishing an international "codex alimentarius." The representative of the Congress in this country is Dr. H. W. Wiley of this Department.

Pan-American Scientific Congress.—The executive committee of the First Pan-American Scientific Congress announces that this body, which is the successor of the Latin-American Scientific Congress, will meet at Santiago, Chile, December 1-10. Among the nine sections into which the work of the Congress is to be divided is that of agronomy and zootechny.

Courses in Agriculture at the University of Chicago.—The Agricultural Guild of the University of Chicago has been organized to give practical training in agriculture to meet the needs of 3 classes: (1) Owners of specialized farms who desire expert advice, efficient farm managers, and a high grade of student labor; (2) young men schooled in the science of agriculture who feel the need of practical training in economics and the management of farms, and (3) boys and young men who desire a practical training in the art of agriculture to fit them to operate farms for themselves or to work as employees on specialized farms.

The University announces that the Guild aims to supplement without duplicating the work of the agricultural colleges, by giving the practical training which their limited equipment and different purpose prevent them from providing. Its work will be done on ten farms in the immediate vicinity of Chicago, which will give to graduates of agricultural colleges and others an opportunity to perform all of the operations involved in modern farming, thus doing for them what some large manufacturers and railroad companies are doing for college graduates in engineering.

It is proposed to give a 3-year course of training, and to allow students who render efficient service their board, room, washing, and $15 a month for the first year, $20 a month for the second year, and $25 a month for the third year. Students who complete satisfactorily the prescribed work will be awarded a diploma and paid $200 in money. They may also supplement the practical training by taking courses in the social sciences and in any of the physical or biological sciences relating to agriculture at the University of Chicago or at any other institution.

The Guild is governed by a board of advisers consisting of the owners of the several farms, the president of the university, the dean of the faculty of arts, literature, and science, the head of the department of political economy, and the director of the Guild, Prof. William Hill. It is hoped eventually to develop it into a school of agriculture of the University.

Agricultural Botany at Cambridge University.—Through the generosity of the Worshipful Company of Drapers, which has offered to supplement its previous contributions to the Department of Agriculture at Cambridge University by an additional grant until 1919 of $1,000 a year to be used for a second professorship, a chair of agricultural botany has been established. R. H. Biffen has been elected to the position and will continue in connection with it his investigations on the hybridization of wheat and barley.

Assistance for Jews in Practical Agriculture.—The Jewish Agricultural and Industrial Aid Society, an organization supported by the Baron de Hirsch fund to aid Jewish immigrants to secure employment along industrial lines, has now inaugurated an agricultural bureau which will endeavor to locate Jewish immigrants on farm lands which they can subsequently secure as homes, and to interest them in the best methods of farming. In this connection it is proposed to publish a monthly agricultural journal in the Yiddish language.

New Veterinary Schools.—According to *Breeders' Gazette*, a veterinary school of the University of Illinois will soon be opened at the Chicago Union Stock Yards, where a lease for 99 years has been secured of the necessary land. The packing-house interests have contributed $250,000 for buildings and equipment for the school, and a State appropriation of $30,000, made to the University of Illinois, is to be available for maintenance.

A veterinary school has recently been established in Washington, D. C., by the trustees of George Washington University. A part of the instruction is to be given in conjunction with the medical school of the university, but special buildings including a veterinary hospital, lecture and demonstration rooms, and an anatomical laboratory are being fitted up. Among the faculty are Drs. R. J.

Formad, Adolph Eichhorn, Albert Hassall, and R. J. Stafford, of the Bureau of Animal Industry, of this Department.

New Journals.—*Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstations* is being issued from time to time by the director of agriculture of the Netherlands to serve as a record of the scientific investigations of the experiment stations of that country.

Revista Official Missão Agronomica a Cabo Verde has been established as the monthly organ of the Portuguese Agricultural Mission to Cape Verde and is to be devoted especially to the promotion of agriculture in that colony.

The *Journal of Economic Entomology* has been established as a bi-monthly by the Association of Economic Entomologists as its official organ. Dr. E. Porter Felt is editor, A. F. Burgess associate editor, and Director E. D. Sanderson business manager, with L. O. Howard, James Fletcher, H. T. Fernald, S. A. Forbes, H. A. Morgan, and Herbert Osborn as the advisory board. The initial number contains lists of meetings, officers and members of the association, the proceedings of the annual meeting at Chicago, December 27–28, 1907, editorials, book reviews, and entomological notes.

Necrology.—In an obituary note on Sir Robert Strachey, who died February 12 at the age of 91, *Nature* states that "probably no single person had clearer views of the future that lies before meteorological work as a matter of practical influence upon everyday life, or was more fully conscious of the long years of observation, organization, and study that are necessary to secure the advantages which will ultimately more than reward the long years of patient inquiry."

E. J. Castle, well known as a horticultural writer, died at Lyminge, Kent, March 4, at the age of 39 years.

Ivan Stožir, founder and former director of the Royal Meteorological Observatory at Agram, Hungary, died February 12, after a brief illness.

The deaths are announced of Dr. A. Rümpler, professor of agricultural chemistry in Breslau, and Dr. Rinaldo Ferrini, professor of technological physics at Milan.

Miscellaneous.—The Fifth Annual Conference of the Rhode Island League of Rural Progress was held in Providence March 16–18. The programme included addresses and discussions on Woman's Work in the Home, Agriculture as a Branch of Industrial Education, conferences on grange work, religious work, and home education in the rural communities, and a symposium by delegates of the various organizations represented on The Possibilities of Rural Rhode Island and What the League Can Do Toward Realizing Them.

Outing begins in the April number a series of articles on The New Spirit of the Farm, by Agnes C. Laut. The opening chapter, entitled Plow Time, gives a popular account, with a large number of illustrations, of some of the work under way at the Minnesota and Wisconsin colleges of agriculture and experiment stations.

Dr. F. Mach of the agricultural experiment station at Marburg has been appointed director of the station at Augustenberg in Baden.

Dr. Friedrich Loeffler, professor at Greifswald, has been called to the chair of hygiene in the Berlin Veterinary School in the place of Professor Ostertag.

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EXPERIMENT STATION RECORD.

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The proportion of the different mineral or ash constituents in farm crops and other agricultural products has been a question commonly studied by experiment station observers, such work having been undertaken most often from the standpoint of the draft which the plant makes on the soil. It was argued that the material removed by the plant from the great storehouse of mineral matter in the soil must be returned as fertilizer or the fertility of the soil would diminish. In such studies of ash constituents the function of mineral matter in plant life processes and other questions were not usually considered. However, studies have been by no means rare in which questions of plant physiology have been taken up with a view to securing a better understanding of mineral matter in relation to plant physiology.

The problem of the use which the animal makes of the mineral matter supplied by the plant has received less attention than almost any other of like importance connected with the subject of animal nutrition, the general assumption being that the animal would secure from the usual food supply enough of the ten or twelve mineral elements regarded as essential. A reason for this belief has been the fact that the total demand for mineral matter is relatively small after the body has attained its growth, and that the ordinary feeding stuffs contain some or all of the mineral constituents regarded as essential; and hence with a comparatively wide range of feeding stuffs and a reasonably generous ration it might be supposed that the animal would secure all that was needed. In the case of common salt, however, an exception may be noted, for it has been a general farm practice to supply salt to farm animals, the custom being a very old one and undoubtedly based on the observed fact that wild animals so generally seek salt licks, in response apparently to an instinctive demand for this addition to their food. Sulphur, wood ashes, or some similar material is not infrequently supplied with salt, but doubtless more often with the idea of providing a tonic or vermifuge than mineral matter required by the animal body.

That domestic poultry require mineral matter in the form of grit for their digestive processes and lime for the formation of eggshells is, of course so generally believed that it need only be mentioned. The relation of mineral matter to egg yield and to other poultry problems has been a profitable field of experiment station inquiry.

Rather recently there has been a notable revival of interest in ash constituents in relation to animal feeding, as is witnessed by the numerous reports of experimental studies which have been published, the majority of them by European investigators, of the relation of lime and phosphorus in different forms to the growth and development of the body and to various questions concerned with mineral matter and theories of nutrition. The work with farm animals has kept pace with similar studies of the importance of mineral constituents in human nutrition, in which the demands of the body in adult life are considered, as well as the special problems which pertain to the period of infancy and youth.

The foreign work has awakened a good deal of popular interest and as a result it has become a by no means uncommon practice to supply calcium phosphate in the form of bone meal or in some other way to farm animals fed for different purposes, as well as to young and growing animals.

A considerable number of mineral mixtures have been placed on the market in Europe, and as is the case with many such commercial products it has been shown by investigation that these mixtures are made up of materials of rather low cost and that if a farmer desires to use them he may make them at home for considerably less than the usual market price.

In the United States the work carried on at the New York State Station, which contributed so much to our knowledge of the phosphorus-containing body called "phytin" in wheat bran and its apparent physiological importance, is a noteworthy contribution to the subject of mineral matter in relation to animal nutrition. This station has also reported valuable work on the importance of mineral matter in poultry feeding.

Mention should also be made of the important studies of iron in food and its functions in nutrition, and of other mineral constituents of the diet carried on as a part of the cooperative nutrition investigations of the Office of Experiment Stations.

The extended study of the composition of local-grown feeding stuffs at the Hawaii Station showed that many of them, particularly common forage crops, are deficient in lime, owing doubtless to the fact that they are grown on volcanic soils. In many cases cattle have not made good growth and milk yield has not been satisfactory. The conclusion seemed obvious that this was attributable to the deficiency in lime in some of the common Hawaiian feeding stuffs and as a remedy it was suggested that the readily accessible feeds which were richer in this constituent should be used in larger proportion or other means taken to increase the lime content of the ration.

Investigations undertaken under government auspices in the Transvaal have shown a similar lack of calcium, or more accurately a deficiency of calcium in proportion to phosphoric acid in some of the most important local feeding stuffs, notably oat hay and corn, and to this deficiency has been attributed disease, lack of thrift, and other unfavorable conditions which have been observed particularly with horses and mules. It is a custom to feed these animals very largely on oat hay and corn and it has been found that supplementing the ration with alfalfa hay or some other feeding stuff which will make good the deficiency in mineral matter will correct the evils. For a similar reason the feeding of crushed bone to cattle is practiced in South Africa and is attended by good results.

The results of a number of pig-feeding experiments at American and Canadian experiment stations also have a bearing on this question. It has been repeatedly shown that pigs fed corn alone do not make satisfactory growth and that better results are obtained when some feeding stuff, for instance, animal meal, which is richer in protein than the corn, is added to the ration. It was natural to suppose that the improvement noted was due to the larger proportion of protein and to a better balanced ration, and it is probable that the results obtained are in greater or less degree due to this factor, but it seems apparent that it is not the only factor involved. Corn, as is well known, is deficient in mineral matter as compared with a good many other common feeding stuffs and there is reason to believe that it is the mineral constituents of the supplementary feed, as well as the added protein, which are responsible for the better gains and improved physical condition.

Of special interest in this connection are the physiological studies made with small animals on the effects of abnormal quantities of protein or the comparative value of protein from different sources. For instance, it seemed apparent from some of the observations made that an exclusive meat ration was attended by serious results manifested by rough coats or abnormally developed organs. Further investigation, however, has shown that the abnormal conditions are not dependent altogether upon the character and amount of protein fed but are influenced by the ash constituents also. For instance, when lime was added to the meat ration of rats fed for experimental purposes, the coat was smooth and lacked the abnormal characteristics observed with rats fed meat only.

It is interesting to note that in the case of pigs the favorable results were obtained when more protein, and at the same time more mineral matter, was added to the ration, while in the case of the rats it was possibly too much protein which gave the unfavorable results, but that here again the remedy was found to lie in a change of the mineral matter supplied.

The consideration of such data as the foregoing and many other observed facts which have a bearing on the question lead almost inevitably to the conclusion that protein requirement and ash requirement are in some way interdependent. No problem concerned with nutrition has been more generally discussed than that of protein requirement, and perhaps there is nowhere a greater variety of opinion. For this reason it has been often said that the question could not be settled until more experimental evidence was forthcoming. It seems very probable that when the body demands for ash constituents are thoroughly understood physiologists will be in a better position to explain some of the apparent contradictions regarding protein requirement and other perplexing questions which have to do with the kind and amount of nitrogenous material needed for the body under different conditions.

A consideration of questions such as those referred to above makes it obvious that no field promises more in the way of results to the experiment station investigator than that concerned with the mineral constituents of agricultural products and their relation to the nutrition and growth of the plant and the animal. Many of the experimental methods used in the past in the determination of ash constituents were faulty and the results were not very reliable. Methods have, however, been improved and perfected, and difficulties which were formerly encountered may now be obviated.

Problems which suggest themselves are very numerous, including such as the relation of fertilizers to the growth and development of plant tissue with reference to the composition of different parts of the plant, the laws of growth and of development of the animal with special reference to the influence of the mineral and other constituents supplied by different feeding stuffs, and many other similar problems.

A survey of the experimental work in the general field of animal production makes it apparent that while the numerous feeding experiments which have been carried on have contributed a great deal which was valuable from the standpoint of practical feeding they have not supplied a proportionate amount of data of importance in discussing fundamental laws of nutrition. Up to the present time the study of feeding problems has been more often a comparison of feeding stuffs, of different rations, or of different methods of care and management, than a study of the principles which underlie such questions. The work done has been well worth while and has served its purpose admirably, but it has been apparent for some time that the limits of usefulness of such methods of study were being approached and that experiments of a different character must be undertaken. Fortunately, the Adams fund makes possible a great extension of the scientific work of the experiment stations, and it is to be hoped that station workers will turn their attention to some of the questions which pertain to the mineral matter in relation to animal nutrition.

According to data recently compiled in this Office, the publications of the stations during the fiscal year 1907 included 459 circulars, bulletins, and annual reports, with an aggregate of 16,917 pages. Add to this the large number of press bulletins, leaflets, and similar matter and the literary output of the year represents an average for each station of at least ten publications and of not far from four hundred pages. At many of the stations these figures are much exceeded, the bulletins and circulars in two cases numbering twenty-six and in another twenty-two, and the pages in two instances exceeding one thousand each.

The preparation for publication of this substantial amount of material constitutes a phase of station work entitled to much consideration. Through these bulletins, circulars, and reports, sent out to mailing lists ranging from a few hundred to over forty thousand, the station is chiefly known to its immediate constituency and to the scientific world as well. By the character of these publications to a considerable degree its work will be judged.

The need of careful editing seems manifest. The transformation of a mass of original data into a printed report requires in many cases technical knowledge and constructive ability of the same high order as the investigation itself. Without such editing a finished product ought no more to be expected than from haphazard methods of inquiry, for the same general principles govern throughout. To neglect in the manuscript the rules which have been scrupulously adhered to in the field or in the laboratory may be needlessly to imperil the usefulness of the investigation, and even to cause unfavorable reflection upon the work of the author and the station.

The necessity of greater attention to editing is becoming generally recognized, and in an increasing number of the stations special provision is being made for it. At two stations officers designated as editors are now maintained, and although they are also assigned other duties the bulk of their time is available for editorial work. At other stations the duty is intrusted to the director or to some member of the station staff or of the college faculty. In many stations the matter is still left largely to the judgment of the individual investigator.

It is sometimes pleaded in defense of the last-named policy that the investigator of necessity has an intimate knowledge of the subject-matter and a personal interest in its presentation that can not be delegated to another. Admitting the force of this contention, part of which, however, applies to the collection of the data into the rough draft rather than to its subsequent editing, objections may be urged against the practice which render its continuance in many cases a doubtful economy.

Aside from the obvious advantage of having material read and criticised by more than one person before publication, it is common knowledge that many scientific men are temperamentally unfitted for editing their own work. The primary aim of the investigator is the discovery of truth rather than its dissemination. For him the problem solved has lost its chief interest. Its utilization is the concern of others. The preparation of manuscript is even an obstacle in the way of new investigations. Doubtless the endeavor will be to perform the duty with the conscientiousness which has characterized the experimental work, but at best it is uncongenial, and uncongenial work may easily become perfunctory.

Another danger is that the point of view of the reader may be lost sight of. A characteristic of the station publications is the variety of purposes for which they are intended, but this diversity in requirement is not always taken into account by those preparing them. As a result many station bulletins are a confused jumble of the technical and popular. Sometimes the author may be able to prepare a creditable scientific report, but not a popular bulletin. Too often it does not seem to be realized that if the publication is not adapted to its purpose the whole work may go for naught.

Not infrequently scientific men are not good writers for other reasons. They do not possess the power of clear and logical statement, close coordination of facts, and effective development of thought. Seldom, too, have they the special and technical training demanded for the critical examination of manuscript, the reading of proof, and a host of other mechanical details which must be mastered by some one in the station or committed by default to the local printer.

Doubtless a portion of this training may be acquired, at least in a superficial way, as occasion requires, but for proficiency careful preparation and long practice are essential. An indication of the realization of this fact may be noted in the recent establishment at the Kansas State Agricultural College of a four-year course in printing leading to the degree of bachelor of science. In addition to the practical work in printing, proof reading, and editing, this course provides for instruction along scientific and cultural lines. Yet, according to an announcement sent out regarding the course, "It is not expected that at graduation a student will be an expert in any line," and a graduate course leading to a special degree is also offered to provide for additional study.

Indispensable in station editing as is much of the training afforded by such courses, to be most useful the station editor must be more than a trained printer. The critical examination of material merely for clearness and accuracy is an important service, but the editing may be made of much greater value if it can be extended to questions of fact. A bulletin conforming to all the rules of rhetoric and gotten out in most attractive form is of doubtful worth if scientifically at fault. Editing which will prevent this calls for sound judgment, great tact, and broad culture, but discreetly performed may lead to much improvement, especially where it takes the form of joint effort of editor and author.

Slowly but surely we are coming to realize that in the experiment stations, as in most other agencies of progress, the services of the specialist must be enlisted in every possible way. With the enlargement of resources and personnel and the broadening scope and extent of our research, the employment of trained editors will become increasingly necessary. To meet this need will be to do much to maintain the standing of the stations as scientific institutions and to add much to their usefulness in the world's work.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Starch in nature and in the laboratory, J. Wolff (*Ann. Brass., 1907, p. 361; trans. in Amer. Brewer, 40 (1907), No. 11, pp. 546–550*).—From a summary of recent experiments on the phenomena of liquefaction and coagulation of starch the conclusion was reached that the principal factors which come into play are the physical state of the starch and the reaction of the salts which accompany it.

Experiments are reported on the action of malt diastase at 65° C. on starch of different sorts. The lowest amount of starch inverted, 25.4 per cent, was noted with rice and the highest value, 99 per cent, with white Cuzco corn.

"In these experiments 25 cc. of 10 per cent malt extract were used with 3 gm. of the raw starch. The microscopic examination of the various samples shows nothing abnormal morphologically. Thus we see that the physical properties of raw starch may be very different, even for varieties of the same species. This more or less great resistance of raw starches toward diastase does not therefore suffice to class the species in such and such category since they may vary with the climate, but it permits us to explain how in the aerial organs, or those reserve organs of the same plant, starch may be found in greatly different physical states."

Studies of enzymic action. I, The quantitative determination of proteolytic cleavage by means of titration with formol, S. P. L. Sørensen (*Compt. Rend. Lab. Carlsberg, 7 (1907), No. 1, pp. 1–57*).—An extended study of experimental methods.

The specific rotation of alcohol extracts of cereal flours, Lindet and L. Ammann (*Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 16–17, pp. 968–974; Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 4, pp. 253–255*).—According to the authors, the specific rotation of alcohol extracts of cereals varies with the concentration of the solution. From the results reported the conclusion is drawn that wheat gliadin is made up of two constituents for which the names α-gliadin and β-gliadin are proposed. Data are also reported regarding the alcohol extracts of rye, barley, and maize.

Concerning the constitution of inosinic acid and muscle pentose, F. Bauer (*Beitr. Chem. Physiol. u. Path., 10 (1907), No. 9–12, pp. 345–357*).—In connection with this study the author states that meat extract contains free pentose in addition to that produced from inosinic acid by cleavage.

On the volumetric estimation of potassium as the cobalti-nitrite, W. A. Drushel, trans. by J. Koppel (*Amer. Jour. Sci., 4. ser., 24 (1907), No. 143, pp. 433–438; Ztschr. Anorgan. Chem., 56 (1907), No. 2, pp. 223–229; abs. in Analyst, 33 (1908), No. 382, p. 35; Jour. Chem. Soc. [London], 94 (1908), No. 543, II, p. 66*).—In this method "the potassium is precipitated as potassium sodium colbalti-nitrite by an excess of sodium cobalti-nitrite and the mixture is evaporated on the steam bath. The precipitate is separated by filtration through asbestos and oxidized by hot standard potassium permanganate. The excess of permanganate is bleached by an excess of standard oxalic acid and the solution is then titrated to color by permanganate. The amount of potassium oxid is found by multiplying the oxygen value of the amount of potassium permanganate used by the factor 1.09."

Estimation of phosphoric acid by the Pemberton and Pemberton-sulphuric acid methods, G. H. G. Lagers (*Chem. Weekbl., 4 (1907), pp. 632–634; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 541, II, p. 907*).—The author criticises these methods unfavorably.

The use of calcium nitrate in oxidation fusions, A. Stutzer (*Ztschr. Angew. Chem., 20 (1907), No. 38, p. 1637; abs. in Chem. Zentbl., 1907, II, No. 22, pp. 1811, 1812*).—The successful use of basic calcium nitrate as a flux in determining sulphur in plant substances is explained. The material is shown to have decided advantages for this purpose.

Determination of small quantities of lead in water, Klut (*Abs. in Ann. Chim. Analyt., 12 (1907) No. 11, p. 452*).—In the method here described the lead is precipitated from 4 to 5 liters of water by adding 25 cc. of acetic acid, 500 cc. of a solution of sodium monosulphid (8 gm.), and 100 gm. of sodium nitrate, shaking the solution with 2 gm. of short asbestos fibers to absorb the sulphid, collecting on an asbestos filter, and converting the sulphid to sulphate by treating with peroxid of hydrogen and a little nitric acid. The sulphate is dissolved in hot sodium acetate solution (1 : 4) and converted into oxid by treatment with bromin water. The addition of a solution of potassium iodid, sodium acetate, and acetic acid results in a separation of iodin, which is titrated with sodium hyposulphite and thus affords a measure of the lead present, 253.7 parts of iodin corresponding to 206 parts of lead.

Detection of lead in potable water, M. R. Moffatt and H. S. Spiro (*Chem. Ztg., 31 (1907), No. 51, p. 639; abs. in Ann. Chim. Analyt., 12 (1907), No. 11, p. 452*).—The method described is based upon the blue coloration which lead salts give with hematein.

Practical methods of calculating and stating the results of technical methods of analysis and purification of water, F. Hundeshagen (*Ztschr. Öffentl. Chem., 13 (1907), No. 23, pp. 457–480*).—The subject is gone into in detail.

Soil analysis, J. C. Brunnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1906–7, pp. 70–72*).—A series of analyses of soil of plats used in fertilizer experiments with pineapples is reported. In these analyses "particular attention was paid to proposed modern methods of determining the available plant foods, not only with the 1 per cent citric-acid solution, but also with water saturated with carbonic-acid gas. At the same time different methods of mechanical analyses were tried, and amongst others the sieve-sediment method adopted by the chemical committee of the Agricultural Education Association [E. S. R., 18, p. 114], . . . From the results obtained, this method does not seem to offer any advantages over Schöne's elutriation, usually employed in our laboratory, although it differentiates the 'Klay' into more classes of finer particles."

The analyses show the soils to be of rather poor quality but fairly rich in phosphoric acid. The conclusion is drawn that chemical analysis was not a very sure guide in this case to the fertilizer requirements of the soil.

[Work in the sugar laboratory of the experiment station of Peru], T. F. Sedgwick (*Bol. Min. Fomento [Peru], 5 (1907), No. 9, pp. 3–12; Mem. Estac. Expt. y Lab. Caña Azucar, 1906–7, pp. 5–14*).—A number of analyses of guanos and soils of the region are reported. Methods of determining volatile matter and solubility in citric acid of soils are described.

On the determination of the zeolitic silica in soils, A. Skikov (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 4, pp. 413–415*).—The author found that heating for 3 hours at 135 to 137° C. did not insure complete separation of silica, an appreciable part of which remained in solution and passed into the filtrate.

The analysis of unfermented grape juice, A. THURSTON (*Merck's Rpt., 16 (1907), No. 7, pp. 187, 188*).—Analytical methods are described and the results of the examination of 59 samples of unfermented grape juice are reported.

On an average pure unfermented grape juice contained 20.76 per cent solids and 0.27 per cent ash. The alkalinity of the ash was 25.90 per cent, the polarization value was —30.36, and the specific gravity 1.0156. The author proposes as a standard for unfermented grape juice solids not less than 17.50 per cent, ash 0.25 per cent, alkalinity of the water-soluble ash not less than 25, and direct polarization not less than —25. The material must also be free from antiseptics, artificial color, sucrose, glucose, and alcohol.

Experiments on the separation of sugar by means of gypsum, G. KASSNER (*Ber. Deut. Pharm. Gesell., 17 (1907), No. 6, pp. 243–250*).—In the experiments reported about 75 per cent of the sugar in expressed beet juice was precipitated in combination with calcium sulphate and calcium oxid. The author suggests the possibility of improving the method for practical use in the sugar industry.

The use of acetate of lead for the determination of invert sugar in sugar and molasses, J. B. MINZ (*Vyestnik Sakh. Promuish., 1907, Nos. 10, 11, 13; abs. in Bul. Assoc. Chim. Sucr. et Distill., 24 (1907), No. 12, pp. 1744–1753*).—A critical study of the use of subacetate of lead in the determination of invert sugar by the Herzfeld method.

Estimation of sugar in dried beet pulp, J. G. ZLOBINSKI (*Vyestnik Sakh. Promuish., 1907, Nos. 30, 31, 32, 33, 35; abs. in Bul. Assoc. Chim. Sucr. et Distill., 25 (1907), No. 4, pp. 407–422*).—A comparative study of methods and a proposed modification of the Frühling method for estimating sugar in beet pulp.

Application of Lintner's method for estimating starch in barley to amylaceous materials in general, M. CANET and O. DURIEUX (*Bul. Soc. Chim. Belg., 21 (1907), No. 10, pp. 329–333*).—Starch dissolved in hydrochloric acid is determined with a polariscope.

Is the nitrogen content a true measure of the protein content of barley? E. JALOWETZ (*Wchnschr. Brau., 24 (1907), No. 42, pp. 586–588*).—In judging the value of barley for brewing purposes, the author concludes that the weight per 1,000 grains should be determined as well as the nitrogen content.

The identification of white maize flour in wheat flour and its products, E. CARLINFANTI and G. SALVATORI (*Arch. Farmacol. Sper. e Sci. Aff., 6 (1907), No. 8–9, pp. 458–468*).—To secure data for the detection of corn flour in wheat flour and Italian pastes, the authors determined the dry matter, fat, and the amount of nitrogenous material extracted by boiling iso-amyl-alcohol in a number of samples of corn meal, wheat flour, and flours and pastes containing the 2 cereals.

The identification of horseflesh in meat and sausage products by means of the precipitin reaction, J. FIEHE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 12, pp. 744–751*).—From an examination of a number of samples the author concludes that horseflesh is largely used in the manufacture of German sausage owing to its low price and the difficulty of detecting its presence by means of the glycogen reaction is pointed out. He concludes, however, that its presence may be readily detected by the precipitin method.

The French official methods for analysis of wines (*Schweiz. Wchnschr. Chem. u. Pharm., 45 (1907), No. 50, pp. 782–788*).—A description of the methods of analysis, according to which, by decree of the French ministers of agriculture, of commerce, and of industry, the examination of samples of wine taken for official inspection must be made.

The estimation of total tartaric acid in tartar and wine lees, P. Carles (*Jour. Pharm. et. Chim., 6. ser., 25* (*1907*), *No. 12, pp. 617–619*).—Improvements are suggested for the determination of tartaric acid by the Goldenberg and Giromont method.

Solubilities and extraction values of food colors, E. Gudeman (*Jour. Amer. Chem. Soc., 29* (*1907*), *No. 11, pp. 1629–1634*).—From a number of tests carried on with coal tar and vegetable colors, the author concludes that "the colors extracted or dissolved by many solvents under varying conditions from neutral, acid or alkaline solutions, give no conclusive data for deciding upon the character or class of the colors themselves. The differences in solubility and in extractive values of vegetable colors compared with coal-tar colors are no greater nor less than the differences found between the various colors themselves belonging to the same class of colors.

"Comparative color intensities were also determined, and it was found that only a very limited number of vegetable colors had a color intensity equal to one-fourth that of a corresponding shade of coal-tar color and that the largest number of vegetable colors had one-tenth or less color intensity than the corresponding coal-tar color of similar shade."

The volumetric measurement of coloring matter, L. Pelet and V. Garuti (*Bul. Soc. Vaud. Sci. Nat., 5. ser., 43* (*1907*), *No. 158, pp. 1–38*).—By the method described by the authors certain basic coloring matters are measured volumetrically by titration with acid coloring matter, the combination of the two in the presence of hydrochloric acid forming a precipitate. Some other basic coloring matters are likewise measured volumetrically by means of a solution of iodin in potassium iodid.

The detection and determination of benzoic acid in catsups, fruits, and ciders, H. S. Reed (*Jour. Amer. Chem. Soc., 29* (*1907*), *No. 11, pp. 1626–1629, fig. 1*).—A modification of Mohler's method for detecting benzoic acid is described and also a method for its quantitative determination.

The author states that the method for the estimation of benzoic acid is based on the facts that chloroform very completely extracts benzoic acid from other vegetable acids, such as malic, tartaric, oxalic, etc., in water solution and that the calcium salt of benzoic acid is far more soluble in cold water than the calcium salts of the other acids mentioned. The method is time consuming but, according to the author, gives satisfactory results, particularly when benzoic acid is present in very small quantities.

Methods of fat determinations in milk, A. V. Krarup (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *61* (*1907*), *pp. 23–43*).—Determinations of fat by the Gerber salt method agreed more closely with the results of chemical analysis than did those by the Sichler 45 per cent sin-acid method. The salt method was not quite so accurate as the regular Gerber method (sulphuric acid and amyl alcohol).

Regarding formulas used in calculating total solids of milk, P. Gobert and M. Bouin (*Rev. Gén. Lait, 6* (*1907*), *No. 18, pp. 409–413*).—The authors review various formulas for calculating the quantity of total solids of milk, and conclude [illegible] those given in their previous discussion (E. S. R., 18, p. 1107) are still to [illegible] recommended.

The value of the specific gravity of the dry substance of milk in detecting falsification, K. Teichert (*Landw. Vers. Stat., 67* (*1907*), *No. 5–6, pp. 407–418*).—In the author's opinion the analytical data obtained in an examination of a considerable number of samples of fresh whole milk, whole milk diluted with skim milk, and whole milk skimmed indicate that the estimation of the specific gravity of the dry substance according to Fleischmann's formula does not in all cases show whether the milk has been skimmed, nor whether skim milk has been added.

Test of milk by means of carmin indigo, VAUDIN (*Rev. Hyg. et Pol. Sanit., 29 (1907), No. 12, pp. 1065–1069*).—In making the test the sample of milk containing a small quantity of the color solution is placed in a flask, tightly corked, and kept in diffused light. The color gradually disappears, the time depending on the initial germ content. Milk drawn with no care for cleanliness destroys the color in a few hours, but when drawn under proper sanitary conditions it does not lose color after 24 hours or more at about 60° F. Directions for producing the coloring solution and measuring its strength are given.

Determinations of the water content of butter (*Ber. K. Vet. og. Landbohöjskoles Lab. Landökonom. Forsög [Copenhagen], 62 (1907), pp. 30, figs. 4*).—Butter was prepared for testing by melting a large representative sample and shaking it violently while it cooled. The water content as determined by the ordinary laboratory method of chemical analysis (drying 5 gm. in a small porcelain dish with about 15 gm. granulated pumice stone at 100° for 2 hours) averaged 14.66 per cent, whereas by the English method (drying 10 gm. over direct flame in a porcelain dish for about 10 minutes, using a glass rod for stirring) it averaged 14.79 per cent. In only 6 out of 50 comparative determinations were higher results obtained by the laboratory method. Results by the Gray method were in all cases lower than those by the laboratory method, averaging 0.31 per cent. The English method is recommended for work in creameries, and a special scale constructed for this purpose is described and illustrated. A table showing the proportion of water in butter corresponding to ranges in the weight of the fresh samples from 9 to 10.15 gm., and of the dried samples from 7.15 to 9.1 gm., is given.

Determination of the fat of cheese by means of carbon tetrachlorid, C. MONTANARI (*Staz. Sper. Agr. Ital., 40 (1907), No. 2, pp. 171–176*).—Results obtained by the use of carbon tetrachlorid for the determination of the fat of cheese are given, in comparison with those by the use of ether. Utilization of the former reagent is recommended.

Casein testing (*Paper Making, 26 (1907), No. 12, pp. 544–546*).—The users of casein in manufacturing are recommended to buy only a pure product, and to dissolve it themselves, in preference to using so-called "soluble" casein. Directions are given in some detail for testing the casein.

The analysis and grading of creosotes, A. L. DEAN and E. BATEMAN (*U. S. Dept. Agr., Forest Serv. Circ. 112, pp. 44, figs. 28*).—Investigations reported in a previous publication (E. S. R., 18, p. 1108) have been continued. Considerable data have been gathered regarding the composition of creosotes and in the present publication data are reported regarding the volatility of creosotes, properties of pure coal-tar creosote and oils other than coal-tar creosote, and of mixtures of coal-tar creosote and other oils. The value of thorough creosote analyses is considered and improvements in the method of distillation used in the analyses are described.

In the authors' opinion it seems desirable that there should be two methods of analyzing creosote—a field method to show the general character of the oil under analysis, and a laboratory method adapted to the analysis of oil which for any reason requires careful examination. The details of such methods are given. Various grades of creosote and their uses are explained.

Regarding the new international method of tannin analysis, K. SCHORLEMMER and H. SICHLING (*Collegium, 1907, No. 288, pp. 435–440*).—Results obtained in the analysis of various tannin substances by the present method (E. S. R., 19, p. 309) and by the old method are compared. The authors believe that the data show that the newer method gives the more correct figures.

The estimation of moisture in creosoted wood, A. L. DEAN (*U. S. Dept. Agr., Forest Serv. Circ. 134, pp. 7, figs. 3*).—The ordinary method of determining moisture by drying at 100° is not applicable to creosoted wood because the creosote as well as the water is driven off. The author reports a study of the use of Marcusson's method for this purpose and describes the procedure, which gives satisfactory results. The apparatus for use in carrying out the determination is illustrated. The method is said to be also adapted to the estimation of water in creosote oils.

Concerning the estimation of cellulose, COUNCLER (*Ztschr. Forst u. Jagdw., 39 (1907), No. 7, pp. 428–441*).—A comparison of methods with special reference to the estimation of cellulose in wood.

A borer for soil sampling, J. M. VON HASSEL (*German Patent No. 189982, Sept. 12, 1905; abs. in Chem. Ztg., 31 (1907), No. 96, Repert. No. 88, p. 595, fig. 1*).—The implement described consists of an outer and an inner cylinder so arranged that the latter can be withdrawn and the soil core removed without withdrawing the outer cylinder from the soil.

The sampling and sending of fertilizers, soils, and feed stuffs for free examination (*Massachusetts Sta. Circ. 10, pp. 3*).—A summary of matters to be particularly considered by those desiring to have materials examined by the station.

METEOROLOGY—WATER.

On precipitation types and their influence on the yearly periods of precipitation, G. SCHWALBE (*Met. Ztschr., 24 (1907), No. 9, pp. 385–393; abs. in Science, n. ser., 26 (1907), No. 674, p. 761*).—Four different types, viz, (1) wind and storm type, (2) land rains, (3) transition type, and (4) storm type, are described, and the relation of these types to the yearly distribution as shown by observations on precipitation at Berlin during the 10-year period, 1894 1903, and at other places in Germany, is discussed. The distribution of the types in different parts of Germany is also briefly considered.

"The conclusions, which are of wide application, are as follows: (1) The influence of thunderstorm rains upon the annual rainfall amount is considerable; (2) as thunderstorms occur almost wholly in summer, they tend to make the summer the season of maximum rainfall; (3) without the thunderstorm rainfalls the annual period shows a tendency to heavier rains in spring and fall, with less rain in the extreme seasons; (4) in the interior of eastern Germany the continental type of summer rainfall maximum is marked, so that the annual period is not essentially altered by thunderstorms; (5) rainfall which comes in showers is fairly equally distributed throughout the year; (6) squalls have a maximum in spring and fall; (7) general rains have a winter maximum in coast districts, an autumn maximum in transition areas, and a summer maximum in the interior."

Temperature and moisture of the air at 0.2 and 2.2 meters above the soil (*Ztschr. Forst u. Jagdw., 39 (1907), No. 11, pp. 722–724*).—Observations during each month of 1906 are recorded which show that the vapor pressure varied very slightly at the two heights during the winter, but in summer was considerably greater near the surface of the soil than at the greater height, the greatest difference, 1.2 mm., occurring in July. The relative humidity also increased as the surface of the soil was approached.

A summary of temperature conditions, insolation, and rainfall in middle Japan, E. PAPELLIER (*Gartenwelt, 12 (1907), No. 9, pp. 103–105, fig. 1*).—The general climatic conditions with especial reference to their effect upon the growth of certain garden plants which have been introduced into various parts of Europe from Japan are summarized, and a table shows temperature, frosts, and rainy and snowy days for each month of 1906 at Higashi-Suma in central Japan 100 meters above sea level and 1.5 km. from the coast.

Report on the work of the station of agricultural climatology of Juvisy during 1906, C. FLAMMARION (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), Nos. 10, pp. 1175-1193, figs. 7; 11, pp. 1323-1327*).—As usual, this report contains records of observations on atmospheric pressure, the temperature of the air, soil, and underground water, and the relative humidity, rainfall, sunshine, cloudiness, and radiation. The data are recorded in tables and diagrams.

The mean annual temperature of the air for the year was 10.5° C., which is very near the normal. The temperature of the soil at depths of 0.25, 0.5, 0.75, 1, and 1.5 meters varied with the temperature at the surface, though lagging somewhat behind it. The mean annual temperature of the ground water at a depth of 13.8 meters was 11.25° C. The annual variation was only 1.55° C. The total rainfall was 593.8 mm., the number of hours of sunshine during the year 1,978. The season in general was not strikingly abnormal in any respect.

The results of experiments during 3 years with a large number of different garden crops to determine whether the moon exerts any influence upon the germination and growth of these crops are summarized in this report. The results were contradictory and do not permit of any definite conclusions.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and T. A. BARRY (*Massachusetts Sta. Met. Buls. 229, 230, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1908. The data are briefly discussed in general notes on the weather of each month.

Meteorology, N. C. HAMNER and F. W. CHRISTENSEN (*Pennsylvania Sta. Rpt. 1906, pp. 99-108, 217-240*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 18, p. 210). Monthly summaries of observations are given in the body of the report and the detailed record in an appendix. The summary for 1905 is as follows:

Summary of meteorological observations, 1905.

	1905.	Growing season (Apr.-Sept.).
Barometer (inches):		
Mean	30.045	
Temperature (° F.):		
Mean	47.6	61.7.
Highest	89 (June 19)	89 (June 19).
Lowest	-11 (Feb. 14)	18 (Apr. 17).
Greatest daily range	45 (Apr. 4)	45 (Apr. 4).
Least daily range	3 (Jan. 2, Oct. 31, and Dec. 19, 20).	
Mean daily relative humidity (per cent)	83.3	78.4.
Rainfall (inches)	37.08	19.83.
Number of days on which 0.01 in. or more of rain fell	133	72.
Mean percentage of cloudiness	48.4	43.7.
Number of days on which cloudiness averaged 80 per cent or more.	105	38.
Last frost in spring		May 24.
First frost in fall		Sept. 26.

The climate of Buenos Aires (*Statis. Ann. City Buenos Aires, 16 (1906), pp. 3-8*).—Tabular summaries are given of observations on pressure, temperature, humidity, rainfall, velocity of the wind, and sunshine, and on the ozone, carbon dioxid, and ammonia content of the air. Observations at frequent intervals on the bacteria content of the air are also reported, with analyses (nitrogen content) of the rainfall of each month. The total annual rainfall was 768.3 mm. This contained 36.29 mg. of free ammonia, 10.92 mg. of organic ammonia, 0.18 mg. of nitrous acid, and 8.94 mg. of nitric acid per 1,000 cc.

Meteorological observations [in Egypt, 1904] (*Cairo: Survey Dept., Egypt, pp. 254; abs. in Quart. Jour. Roy. Met. Soc. [London], 33 (1907), No. 143, pp. 257-260*).—Tabular summaries are given of observations on atmospheric pressure, temperature, precipitation, humidity, cloudiness, vapor tension, and direction and velocity of the wind at Abbassia, Alexandria, Assiut, Assuan, Berber, Dueim, Gizeh, Helwan, Khartum, Mongalla, Port Said, Roseires, Suakin, Wady Halfa, and Wad Medani.

The rains of the Nile basin and the Nile flood of 1906, H. G. Lyons (*Survey Dept., Egypt, Paper No. 2, pp. 70, pls. 16; abs. in Science, n. ser., 26 (1907), No. 675, p. 800*).—The seven dry years ending in 1905 were succeeded by a flood of nearly average volume in 1906. The Nile flood is determined by the summer rains of Abyssinia.

This bulletin summarizes the available rainfall data obtained at recently established meteorological stations in the Sudan and at points in other equatorial regions near to and within the Upper Nile basin as a basis for prediction of the character of the Nile flood. While the need of more systematic study of the meteorological conditions is recognized, the data already obtained show that "the factors which affect the low-stage levels of the river are (a) the intensity of the rainfall in Abyssinia, (b) its continuance into September and October, (c) the volume stored in the valley of the White Nile, and (d) rainstorms in the months November to April which temporarily raise the water-level."

[Rainfall of the Gold Coast of Africa], A. E. Evans (*Govt. Gold Coast, Rpt. Bot. and Agr. Dept., 1906, pp. 28-32*).—Monthly summaries are given of rainfall at Aburi Botanic Gardens 1897 to 1906, at Tarkwa Botanic Station 1904 to 1906, and at two other places during 1906.

The meteorological year 1906 7 in Middle Europe with special reference to floods and destructive storms, W. Krebs (*Ber. Deut. Phys. Gesell., 5 (1907), No. 20, pp. 572, 573*). This is a brief abstract of a paper based upon data from 42 meteorological stations in Middle Europe during the year ended August 31, 1907.

Meteorology, E. Kleinschmidt (*Jahrb. Naturw., 22 (1906-7), pp. 133-172*).—This chapter reviews the progress during 1906-7 in aerology, meteorological optics, atmospheric electricity, terrestrial magnetism, the behavior of meteorological elements in darkness, and the relation of weather conditions in opposite quarters of the earth.

Air and water, G. Bleuel (*Jahresber. Agr. Chem., 3. ser., 9 (1906), pp. 3-42*).—This is the usual review of investigations (up to the end of 1906) on the chemistry and physics of the air and of atmospheric precipitations, on spring, drainage, and sewage waters, and on the purification of sewage water. A classified bibliography is given at the end of the chapter.

The construction of drain gages at Pusa, M. H. Arnott and J. W. Leather (*Mem. Dept. Agr. India, Chem. Ser., 1 (1907), No. 5, pp. 57-77, pls. 20, figs. 6*).—The method and cost of construction of two drain gages, each having a superficial area of 7 ft. 4 in. by 6 ft., and one 6 ft. deep, the other 3 ft. deep, are given in detail. The gages are similar to those which have been in use at Rothamsted for a long period of years, and to those constructed at Cawnpore in 1903. In the construction of these gages great care was exercised to inclose the undisturbed soil in its original state.

Surface water supply of California and of the North Pacific coast drainages, 1906, W. B. Clapp, J. C. Stevens, et al. (*U. S. Geol. Survey, Water-Supply and Irrig. Papers Nos. 213, pp. 219, pls. 4, figs. 2; 214, pp. VI+208, pls.*

3, figs. 2).—These papers, like the preceding numbers in the same series, contain information similar to that published in previous years under the title Report of Progress of Stream Measurements, and include not only records of flow of streams in the areas named, but data regarding precipitation, evaporation, water power, and river profiles, as well as "the results of computations based on these data, and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc."

Geology and water resources of a portion of the Missouri River Valley in northeastern Nebraska, G. E. CONDRA (*U. S. Geol. Survey, Water-Supply Paper No. 215, pp. 59, pls. 11*).—"The region considered in this report lies in northeastern Nebraska, south of Missouri River, and extends about 150 miles east and west and approximately 29 miles north and south. The total area is over 4,100 square miles, comprising Dakota, Cedar, Knox, and Boyd counties and the northern part of Holt County."

The report gives the results of field studies during the summer of 1903 on topography and geology, including especially mineral resources, surface and underground water resources in general and in detail for each county, besides brief notes on soils, crops, stock raising and dairying, and timber resources.

"The soils of the region are of several types, having been formed by various agencies acting on rocks of different kinds; most of them are closely related to the underlying formations. Much of the eastern and central parts of the area lies in the fertile loess region where the soil is deep and easily worked, receives and holds moisture well, and yields heavy crops on both hilly and level lands. The alluvial bottom-land or flood-plain soil is also fertile and easily tilled, but in the lowest areas fields are often damaged by high waters and by shifting of the river channel. The heavy Pierre clay, or gumbo soil, is especially extensive in Boyd County; it contains some alkali and often affords bad water, but usually produces good grass and heavy yields of corn, oats, and wheat, especially where the clay is mixed with sand. The sandy upland soils in Cedar, Knox, Holt, and western Boyd counties stand droughts well and are gradually being utilized."

Geology and water resources of the Republican River Valley and adjacent areas, Nebraska, G. E. CONDRA (*U. S. Geol. Survey, Water-Supply and Irrig. Paper No. 216, pp. 71, pls. 13, figs. 3*).—This report deals with a portion of southern Nebraska 22¾ miles wide and 272½ miles long, comprising an area of about 6,199 square miles and including the greater part of 10 counties, which are, from east to west, Jefferson, Thayer, Nuckolls, Webster, Franklin, Harlan, Furnas, Redwillow, Hitchcock, and Dundy. These counties lie along the Kansas border, extending from the vicinity of Fairbury westward to the Colorado State line. The report is the result of general observations made during several consecutive seasons and of special field studies during the summer of 1904.

The topography, drainage, and climate are briefly discussed, and the geology and water resources are treated in detail. The agricultural resources (soils, crops, stock raising and dairying, and timber) also receive some attention.

From the average annual rainfall at 8 stations a diagram was platted which shows the rather gradual decline of rainfall from about 30 in. on the eastern boundary to less than 20 in. on the western.

It is shown that in general the area "is underlain by various formations of cretaceous age lying unconformably on carboniferous formations and extensively overlain by tertiary and quaternary deposits. Originally the latter covered the entire surface, but they have now been removed in the deeper valleys."

Detailed data regarding the water supply from surface and underground sources are given for the area as a whole and for each county. The supply of surface water for irrigation is limited, and it has been found that irrigation along the main valley of the Republican in the western counties is practicable only near the headwaters and below the mouths of some of the strong tributary streams. "The counties including most of the area are Dundy, 17,415 acres; Hitchcock, 13,070; Redwillow, 3,935. In 1904 the area was much less."

Agriculture is stated to be by far the most important resource of the region, but is greatly affected by local variations in climate, ground water, and soils. "The many different kinds of soils have not been differentiated. In general, the distribution of the different types corresponds with that of the geologic formations, but minor variations exist, often of considerable importance in plant growth. There are in the region three fairly distinct agricultural provinces—the loess table-lands, the alluvial bottom lands, and the sand hills.

"The loess plains of the wide table-lands between the valleys occupy the greater part of the area treated in this report. Where the streams have cut through the loess, the various underlying formations appear with soils of different kinds extending in narrow belts along the valley slopes. Glacial soils, which occur mostly in Jefferson County, are clayey or sandy, with an admixture of pebbles and bowlders. Soils on or below outcrops of Dakota sandstone are sandy, but in places are clayey or ocherous. Extensive alluvial soils occur along the rivers and their tributaries. They contain a high percentage of silt or sand and usually a small proportion of clay. Soils formed from the cretaceous shales and chalk rock extend along some of the valley slopes not covered by loess or alluvium, and are usually of bad quality for agriculture.

"In the sand-hill region loose sandy soil of the dunes consists mainly of quartz sand with but little clay, while in the basins and dry valleys there is an admixture of some humus and considerable clay.

"The table-land soil is sandy, and may grade into sand hills on one side and into the so-called plains marl or western loess on the other. The talus slopes below ledges of tertiary rock are mostly sandy or gravelly."

Dew ponds (*Jour. Bd. Agr. [London], 14 (1907), No. 8, pp. 498, 499*).—This is a notice of a second edition of a book by A. J. and G. Hubbard on Neolithic Dew ponds and Cattleways (E. S. R., 17, p. 533).

A contribution to the study of the location of underground water, L. REY (*Jour. Agr. Prat., n. ser., 14 (1907), No. 44, pp. 567–570*).—The external features indicating the presence of underground waters are described.

Relation between radioactivity of underground waters and their hydrology, F. DIENERT and E. BOUQUET (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 12, pp. 894–896, fig. 1; abs. in Rev. Sci. [Paris], 5. ser., 8 (1907), No. 22, p. 701*).—A study of the radioactivity of various spring waters showed variations in this property corresponding with changes in level of the ground water and in electrical resistance. The radioactivity was especially marked in the upper levels of the water and varied at different depths. No differences corresponding to geological and paleontological conditions were observed.

SOILS—FERTILIZERS.

Soils, C. W. BURKETT (*New York and London, 1907, pp. XII+303, pl. 1, figs. 129*).—The book treats in a popular way of the properties, improvement, and management of soils and the problems of crop growing and feeding. Different chapters deal with soil makers, the soils that living things have made, what we find in soils, the texture of the soil, how plants feed, the elements that plants use, how plant food is preserved, getting acquainted with plant food, the potential plant food—its stores and nature, the rôle the tillage plays, liming the land—

a corrective for acidity, the quest of nitrogen, the release of soil nitrogen, nitrification, reclaiming lost nitrogen, soil inoculation, draining the land, soil water—how it is lost and how it may be held, dry farming—a problem in water conservation, tillage tools, the cultivation of crops—the tools and purpose, stable manure—its composition and its preservation, handling manure on the farm, buying plant food for the soil, using chemical manure intelligently, mixing fertilizers at home, dairying—an example in soil building, rotation of crops, and the old worn-out soils—what we may do for them.

Chemical analysis of soils, W. P. Brooks (*Massachusetts Sta. Circ. 11, pp. 2*).—This is a brief statement regarding the probable value of soil analyses as means of determining fertilizer requirements and of the conditions under which the station will undertake such analyses for private parties.

Moisture content and physical condition of soils, F. K. Cameron and F. E. Gallagher (*U. S. Dept. Agr., Bur. Soils Bul. 50, pp. 70, figs. 33*).—This bulletin gives the results of an investigation on the relation of physical condition to moisture content.

In these investigations the soils were put into different states with varying amounts of water and then subjected to various quantitative physical tests. Account was also taken of the judgment of experienced greenhouse men as to the general physical condition of the soils before and after the measurements were made. The physical factors studied were penetration and cohesion, apparent specific gravity or volume as related to moisture content and successive wetting and drying, rate of evaporation, and moisture distribution. The previous investigations on each of these phases of the subject are reviewed and the special apparatus and methods employed in the investigations here reported are described in detail.

The conclusions in general are that the physical condition of the soil is most intimately connected with its water content, as shown not only by the general behavior and appearance of the soil but also by the systematic quantitative measurements of the physical factors named. The investigations are further held to show a marked accentuation in the physical properties at a critical water content and that this critical content is identical with the optimum water content. This critical moisture content was found to agree quite closely with the moisture equivalent as determined in 3 soils by the Briggs and McLane method (E. S. R., 19, p. 416).

"The moisture-penetration curve shows a minimum force required for penetration at the optimum water content; the moisture-apparent specific gravity curve shows a minimum point at the optimum water content; the curves for evaporation show a marked difference in the rate of evaporation above and below the optimum water content. It is apparent, therefore, that the true significance of optimum water content is that particular content at which the soil can be put into the best possible condition for plant growth. The plant can then best draw its needed water from the soil because all the other factors making for good growth are also at their best. Moreover, an increase in water content in excess of the optimum generally produces a greater detrimental effect on the plant than a decrease below the optimum."

The conclusion is therefore drawn that as a rule the physical optimum as determined by the soil properties is also the physiological optimum as determined by the plant. "The available evidence seems to be conclusive that the problem of water supply and optimum water content is fundamentally a soil problem and incidentally a plant problem." The data reported in support of this conclusion regarding the physiological optimum include determinations according to Heinrich's method (E. S. R., 7, p. 481) of the moisture content at which 19 different kinds of plants began to wilt in a calcareous soil and in a peaty soil, these percentages varying in the case of the calcareous soil from 5.07 per cent with potatoes to 11.3 per cent with horse beans, and in case of the peaty soil from 32.3 per cent with oats to 43.6 per cent with wheat.

"Another point which this investigation has brought out in a striking way is the 'hysteresis' observable in the volume change when a soil is alternately wetted and dried out. This process results in a natural packing of the soil and is seriously detrimental to the maintenance of good tilth if the extremes of moisture content reached are wide apart."

The action of water and aqueous solutions upon soil carbonates, F. K. Cameron and J. M. Bell (*U. S. Dept. Agr., Bur. Soils Bul. 49, pp. 64, figs. 5*).—This bulletin reviews the literature of investigations on the solubility of carbon dioxid, lime, calcium carbonate, magnesia, and magnesium carbonate in water and aqueous solutions of various kinds. It includes investigations previously reported by the Bureau of Soils (E. S. R., 13, p. 428; 14, p. 524; 18, p. 117; and 19, p. 221) as well as others here published for the first time.

The following are in brief the general conclusions drawn from the work: The solubility of carbon dioxid in salt solutions is less than in an equal volume of water. The solubility of the dioxid in water is increased by addition of nitric acid, in sulphuric acid is decreased by the addition of water, and in water is decreased by the addition of sulphuric acid. Consequently there is a mixture of sulphuric acid and water which dissolves a minimum quantity of carbon dioxid. "The more concentrated the solutions are, the less carbon dioxid is absorbed. The solubility in solutions of strontium chlorid is between that in calcium and barium chlorids. The quantity of carbon dioxid absorbed becomes less as the temperature increases. The solubility is less in sulphate solutions than in chlorid solutions, and less in chlorid solutions than in nitrate solutions. Solutions of sodium salts absorb carbon dioxid less readily than solutions of similar potassium salts, and solutions of ammonium salts are better solvents than solutions of either sodium or potassium salts."

The apparent solubility of lime in aqueous solutions depends largely on its origin, and, therefore, on the impurities it contains. At 0° C. it is approximately twice that at 100° C., the temperature solubility curve approximating a straight line. The solubility in dilute solutions of sodium, potassium, and ammonium chlorids is greater than in pure water. The solubility curves for solutions of sodium and potassium chlorids have maximum points, and the solubility is less in saturated solutions than in pure water.

"The solubility of lime in very dilute solutions of calcium chlorid seems to be less than in pure water, but as the concentration increases the solubility is raised much above that in pure water, especially at higher temperatures.

"At lower temperatures and in the more concentrated solutions of calcium chlorid the stable solid phase is calcium oxychlorid.

"The presence of other hydroxids depresses markedly the solubility of lime.

"The presence of gypsum does not appreciably affect the solubility of lime.

"In contact with very dilute solutions of calcium nitrate, lime passes into solution as such, the solubility increasing with concentration of nitrate; at higher concentrations the stable solid is one of a series of solid solutions, the content of lime still increasing with increase of nitrate; at still higher concentrations the stable solid is a basic nitrate of definite composition, and the concentration of lime in solution falls with increase of nitrate; finally, at very high concentrations the neutral nitrate separates as a solid phase.

"In solutions of glycerol or mannite the solubility of lime is increased markedly with increase of concentration of the carbohydrate.

"When lime is brought into contact with sugar solutions the ratio of lime to sugar in the solid varies continuously with the composition of the solution, and consequently the solid compound resulting when lime is added in excess to a sugar solution is one of a series of solid solutions.

"Cold sugar solutions have a much greater solvent action upon lime than have the same solutions when hot. Heating tends to precipitate one of the solid solutions described above.

"The ratio of lime to sugar in solution depends on the temperature and on the concentration."

The results of the studies of the solubility of calcium carbonate lead to the conclusion that—

"Calcite is the stable form of calcium carbonate at ordinary temperatures. In concentrated salt solutions or at the higher concentrations, aragonite is probably the stable phase. Regarding the formation of natural dolomite, the literature affords no satisfactory explanation. High temperatures and concentrated solution seem to be necessary for its formation. At the low temperatures calcium carbonate forms a hydrate with five molecules of water of crystallization. The results upon the solubility of calcium carbonate in water are very discordant, but there is good authority for the generalization that it is more soluble in hot water than in cold. The solubility . . . in water containing carbon dioxid increases as the quantity of carbon dioxid in solution increases. [It] is depressed by the addition of caustic soda to the solution.

"The caustification of sodium carbonate by lime is more complete in dilute solution. Calcium carbonate forms with sodium carbonate two double compounds, whose stability depends on the temperature and the concentration of the solution with which they are in contact.

"The solubility of calcium carbonate is increased by addition of sodium chlorid or of sodium sulphate. When the pressure of carbon dioxid is one atmosphere, the solubility of calcium carbonate passes through a maximum upon increasing the concentration of sodium chlorid in solution, both in the presence and absence of gypsum. When increasing quantities of sodium sulphate are added, however, the solubility of the carbonate constantly increases. The solubility of calcium carbonate at 25° C. is about six times as great in a saturated solution of sodium sulphate as in a saturated solution of sodium chlorid. When certain solutions containing sodium sulphate and chlorid are saturated with carbon dioxid in the presence of calcium carbonate a new solid phase appears, $2CaSO_4.3Na_2SO_4$.

"When the pressure of carbon dioxid is one atmosphere, the solubility of calcium carbonate passes through a maximum upon increasing the concentration of potassium chlorid or sulphate in solution.

"In the presence of sea water the crystalline modification of calcium carbonate is more stable than the amorphous form. In general the presence of ammonium salts in solution increases the solubility of calcium carbonate. On heating, carbon dioxid and ammonia escape."

Calcium carbonate is soluble in calcium and magnesium salts, in salt solutions which have an acid reaction, and in strong acids whose lime salts are soluble in the strong acid.

"The various determinations of the solubility of magnesia in water are not in accord. The modern writers, however, agree that this solubility is about 10 mg. per liter at 20° C. The solubility of magnesia is augmented by various salts, including magnesium salts, but is depressed by caustic alkalis. Several basic chlorids and bromids of magnesium have been recorded in the literature, and are obtained by adding magnesia to a solution of the chlorid or bromid of magnesium. . . .

"Magnesium carbonate forms several hydrates, each of which is stable within limits of concentration and temperature [and] several double compounds with the alkali carbonates. The solubility . . . is greatly increased by the addition of carbon dioxid to the solution, the solubility being less at the higher temperatures. [It] passes through a maximum as the concentration of sodium chlorid increases, but in the presence of carbon dioxid this solubility is depressed by addition of sodium chlorid. The solubility in solutions of sodium sulphate is increased by increasing the concentration of the latter."

The solubility of calcium carbonate in certain aqueous solutions, F. K. Cameron and W. O. Robinson (*Abs. in Science, n. ser., 26 (1907), No. 660, p. 240*).—This is an abstract of a paper read before the Toronto meeting of the American Chemical Society.

The authors conclude that "calcium carbonate is much more soluble in potassium sulphate solutions than in potassium chlorid solutions. In solutions of potassium chlorid it passes through a maximum. When the system is saturated with carbon dioxid at atmospheric pressure the calcium carbonate is again more soluble in the more dilute potassium sulphate solutions than in those of potassium chlorid, where again it passes through a maximum. In the more concentrated potassium sulphate solutions syngenite is formed."

The solubility of calcium carbonate in aqueous solutions of potassium chlorid and potassium sulphate at 25°, F. K. Cameron and W. O. Robinson (*Jour. Phys. Chem., 11 (1907), No. 8, pp. 577–580*).—This article is based upon data which are also reported in the article noted above.

The solubility of certain salts present in alkali soils, F. K. Cameron, J. M. Bell, and W. O. Robinson (*Jour. Phys. Chem., 11 (1907), No. 5, pp. 396–420, figs. 6*).—This paper reports the results of a study of solubility in 9 combinations of salts occurring in alkali soils, namely, (1) calcium chlorid and sodium chlorid, (2) sodium chlorid and sodium sulphate, (3) sodium chlorid, sodium sulphate, and calcium sulphate, (4) sodium chlorid and calcium carbonate, (5) sodium chlorid, calcium carbonate, and carbon dioxid, (6) sodium sulphate and calcium carbonate, (7) sodium sulphate, sodium chlorid, and calcium carbonate, (8) sodium sulphate, sodium chlorid, calcium sulphate, and calcium carbonate, and (9) sodium sulphate, sodium chlorid, calcium sulphate, calcium carbonate, and carbon dioxid. These are considered typical systems encountered in studying the chemistry of alkali in soils of arid regions, and the conditions were made to approximate as nearly as possible those prevailing in the field.

The results obtained are discussed in some detail and the methods used are described. "Incidentally it has been shown that solid calcium chlorid is not to be expected normally as a component of alkali soils, nor is anhydrite to be expected normally where the salts of sodium and calcium predominate. Further, it has been shown that under certain conditions of concentration a double sulphate of calcium and sodium can exist. At higher temperatures this double salt is the well-known mineral glauberite; at lower temperatures the double salt has been shown to have the composition $2CaSO_4.3NaSO_4$."

A contribution to the chemistry and physiological action of the humic acids, R. A. Robertson, J. C. Irvine, and Mildred E. Dobson (*Bio-Chem. Jour., 2 (1907), No. 10, pp. 458–479, pls. 2, figs. 3; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 23, p. 1248*).—Studies of the chemical composition of various samples of natural and artificial humic acids and of the effect of the acids and their salts on fungi are reported. The results are summarized as follows:

"(1) Natural humic acid obtained from peat varies greatly in composition, according to the method of preparation. When prepared through the ammonium salt the percentage of carbon is lower, and that of nitrogen is higher, than when prepared from the potassium salt.

"(2) Natural humic acid contains more combined nitrogen and less methoxyl than the artificial forms.

"(3) The form of humic acid obtained from cane sugar, which resembles most closely the natural acid, differs greatly in chemical structure from the latter.

"(4) The artificial acid is unaltered in composition by conversion into the ammonium salt and reprecipitation.

"(5) Humic and saccharo-humic acid and their potassium salts are utilizable by Penicillium as sources of organic carbon.

"(6) Potassium humate and, to a less extent, potassium saccharo-humate serve as organic nitrogen food compounds for Penicillium.

"(7) The conclusions drawn from the physiological results of experimental cultures of Penicillium in the acids and their potassium salts are in concordance with those arrived at as the result of chemical analysis of the compounds."

The presence of secondary decomposition products of proteids in soils, O. SCHREINER and E. C. SHOREY (*Jour. Biol. Chem., 3 (1907), No. 3, pp. XXVIII, XXXIX; abs. in Chem. Abs., 1 (1907), No. 17, p. 2259*).—The preparation of picoline carboxylic acid from sodium hydroxid extract of soils is described. See also a previous note (E. S. R., 19, p. 419).

The importance of micro-organisms in the circulation of nitrogen in nature, C. BARTHEL (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 4–5, pp. 324–334, fig. 1*).—A discussion of recent investigations on this subject.

Progress in legume inoculation, K. F. KELLERMAN and T. R. ROBINSON (*U. S. Dept. Agr., Farmers' Bul. 315, pp. 20*).—The main facts brought out in this bulletin are summarized as follows: "(1) Abundant nodule formation improves the chemical composition as well as increases the quantity of a leguminous crop. (2) Leguminous crops with nodules are more valuable as green manure than leguminous crops lacking nodules. (3) Nematode galls or root-knots resemble nodules in appearance, but they are very injurious and care should be taken not to confuse the two growths. (4) It is wisest to depend upon pure cultures for inoculating purposes. If soil is to be used, however, great precautions should be taken in selecting and handling the soil to guard against the introduction of weeds or plant diseases."

Root action and bacteria, F. FLETCHER (*Nature [London], 76 (1907), Nos. 1968, p. 270; 1977, p. 518*).—These are brief notes referring to previous investigations by the author, showing the excretion of toxic substances of an alkaloidal nature by plant roots.

The rôle of the oxidizing power of roots in soil fertility, O. SCHREINER and H. S. REED (*Jour. Biol. Chem., 3 (1907), No. 3, pp. XXIV, XXV; abs. in Chem. Abs., 1 (1907), No. 17, p. 2259*).—Evidence is adduced to show that roots possess well-defined oxidizing powers, due principally to enzyms. Certain substances used as fertilizers promote the activity of roots, and root oxidation is more active in fertile than in unproductive soils.

The products of germination affecting soil fertility, O. SCHREINER and M. X. SULLIVAN (*Jour. Biol. Chem., 3 (1907), No. 3, pp. XXV, XXVI; abs. in Chem. Abs., 1 (1907), No. 17, p. 2258*).—Water in which seeds had germinated and seedlings had grown apparently contained toxic properties which interfered with the growth of a second crop in the same solution. Similar toxic properties were observed in the juice expressed from seedlings. The juice was found to contain cholin, xanthin bases, and soluble organic phosphorus compounds.

Fertility of soils as affected by manures, F. D. GARDNER (*U. S. Dept. Agr., Bur. Soils Bul. 48, pp. 59, figs. 5*).—This bulletin "embodies the results of a uniform scheme of manurial treatments, as measured by the resulting increase in plant growth on soils collected from 220 fields in 23 States, located in the eastern half of the United States." Ninety soil types were represented in the experiments.

The investigations were made by means of the paraffin-pot method described in earlier bulletins (E. S. R., 17, p. 227) and were confined to "high-grade, standard fertilizing materials, consisting of nitrate of soda, sulphate of potash, and acid phosphate, together with air-slaked lime, well-decomposed stable manure, and green cowpea vines. These ingredients were applied to the soil separately and in various combinations." The relative effects of the different fertilizers were measured by the transpiration as well as by the green growth of wheat during the first 18 to 21 days of the life of the plants.

Some of the more important conclusions drawn by the author are substantially as follows:

The paraffin-pot method is a useful means of determining the fertilizer requirements of soils, giving results differing in degree but not in kind from those obtained in the field.

The green weights show more pronounced variations than transpiration. "The green weight of plants grown for about 25 days in the pots occasionally equals or exceeds 1 per cent of the weight of the soil in which they grew. Such plants contain about 85 per cent of water and transpire approximately 100 gm. of water for each gram of green matter produced. The dry matter of such plants is richer in mineral constituents and nitrogen than that of the same plants if matured. The draft on the water and mineral constituents of the soil under these conditions is greater than that occasioned by the removal of a large and matured crop under field conditions."

Soils vary greatly in crop-producing capacity and in the degree to which they respond to commercial fertilizers, lime, manure, and green manures. "In general, the degree of response varies inversely as the crop-yielding capacity and ranges from zero to several hundred per cent. The soils of the Atlantic and Gulf Coast States are much more responsive than those of the Central and Northern States. . . . With few exceptions the character of fertilizer required for soils depends more upon local conditions and practices than it does upon the type of soil or the geological formation to which it belongs. The muck soils are an exception and show a universal response to potash salts."

The organic manures were as a rule more effective than the chemical fertilizers. Barnyard manure and cowpeas with lime were the most effective manures. With the chemical fertilizers used individually the order of efficiency was first nitrate of soda, then lime, potash, and acid phosphate.

In 60 per cent of the soils tested each fertilizer salt appeared to have a special function in plant growth which was not materially modified by adding or withholding other salts. In the pot experiments the aggregate efficiency of the several salts used separately was slightly greater than that of the same salts used in combination.

"The character of fertilizer indicated for a specific soil type as it occurs in widely separated localities usually varies more than that for very different types when in the same locality and subjected to similar environment. . . . In general, the finer the texture of soils the less responsive are they to fertilizers, although the character of fertilizer indicated remains the same."

It is believed that "the condition of the soil is of greater importance than its chemical composition [for] without materially changing the composition of the soil, poor soils by proper manipulation and suitable applications can be made to produce as large crops in the pots as can be grown on the best soils by the same or other treatments."

It is held that "while manure and fertilizers may often increase crop yields as a result of a direct supply of plant food or as a stimulant to the plants, there is now abundant evidence that their effect is rather the result of a direct action upon the soil, thereby changing its relation to plants. Complex and imperfectly understood as is this action, it is a more satisfactory explanation of the benefits derived from fertilizers than the idea that the inconsequential amounts of nitrogen, potash, and phosphorus applied, as compared with the larger stores of those elements already in the soil, should be directly responsible for such marked increase in growth as frequently follows the application of fertilizers. . . .

"It may be said that the crop-yielding capacity of soils is increased by improving their physical condition and by supplying manures or fertilizers. Frequently both are necessary, and the latter may assist the former. By the employment of both methods poor soils may become as productive as the best ones. There is but little to indicate any relation between the formation and character of the soil and character of fertilizer to which it will respond. Usually soils of a limited locality, where climatic condition and farm practices are uniform, show but little difference in the character of fertilizer required, although the degree of response may vary greatly for different fields, making their use profitable in some instances and unprofitable in others. Except in the most general way, the fertilizer requirement of soils becomes a problem for each farm or for each class of farms under like conditions of soil, climate, and system of cropping and fertilization."

Stable manures, W. T. L. TALIAFERRO and H. J. PATTERSON (*Maryland Sta. Bul. 122, pp. 117-138*).—The results of two series of experiments, one of 3 years' duration and the other of 7 years' duration, are summarized in this bulletin. The rotation on which the manures were tested was corn, crimson clover, wheat, timothy, and clover hay. The manures were applied once during the 4-year rotation at the rate of 10 tons per acre.

The results as a rule favored the use of fresh manure applied directly from the stable as against rotted manure. The best results were obtained by applying the manure as long in advance of the time the crop was to use it as possible. As between applying fresh and rotted manure before and after plowing, the results favored applying fresh manure as a top-dressing after plowing. In a comparison of plowing under manure in the fall and spring, the differences were slight but uniformly in favor of allowing the manure to remain on the land during the winter and plowing it down in the spring. The results favored plowing under to a depth of 7 in. as compared with a depth of 5 in. Subsoiling in addition to deep plowing did not show sufficient advantage to warrant the extra expense involved. The benefit derived from adding commercial fertilizers to the manure was not very pronounced in case of wheat. In case of corn some benefit was derived from the use of small amounts of complete fertilizer in the row in addition to the manure. "The use of kainit with the manure seemed to exert a beneficial influence every year, and it was more marked in dry than wet seasons." Applications of straw at the rate of 2 tons per acre produced a considerable increase in yield but was not so valuable in this respect as manure. The growth of crimson clover was better on soils receiving fresh manure than on those treated with rotted manure.

It was evident from the experiments as a whole that the amount of manure applied (10 tons per acre in a 4-year rotation) was not sufficient to maintain the productiveness of the soil, although the yields were always better where manure was used, and it was observed that in case of corn the stand was better on manured than on unmanured soil.

An appendix gives general information regarding farm manures.

Agricultural-chemical work, 1905-6, H. G. SÖDERBAUM (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 2-3, pp. 201-231*).—The paper gives a report of the research work conducted at the experiment station of the Swedish

Agricultural Academy during the year. The following investigations call for brief mention:

On the after effects of different kinds of phosphatic fertilizers.—These trials were commenced in 1901 and the results of the first 4 years' work have been summarized (E. S. R., 17, p. 1052). The trials during the fifth year (1905) were made with Ligowa oats under conditions similar to those of earlier years. The table given below shows the total yields obtained with the different phosphatic fertilizers experimented with, these being applied with and without lime.

Yields of oats grown in vegetation pots, 1905 and 1901–1905.

	Without lime.		With lime.	
	1905.	1901-1905	1905.	1901 1905.
	Grams.	*Grams.*	*Grams.*	*Grams.*
No phosphoric acid	13.3	87.7	14.6	115.2
Superphosphate	37.1	388.8	34.6	389.1
Dicalcium phosphate	26.2	367.4	28.2	394.2
Tricalcium phosphate	23.9	253.6	5.8	132.9
Precipitated phosphate	31.5	353.8	39.0	374.9
Bone meal	27.9	273.2	14.7	142.6

The fertilizer effect of superphosphate was decidedly superior to that of bone meal even during the fifth year. The bone meal during the entire period of five years produced a total increase in yield over that of the unfertilized pots amounting to only 70 per cent of that obtained during the same period by fertilization with superphosphate.

Culture trials with new nitrogenous fertilizers.—Trials with calcium cyanamid and calcium nitrate commenced in 1904 and previously reported (E. S. R., 17, p. 447), were continued during the year, and a new series with "nitrogen lime" (Polzenius' process) was commenced. The experimental crops were oats, carrots, and potatoes, the crops being grown in vegetation boxes, and, in the case of potatoes, in zinc boxes placed in the ground (0.3 sq. meter surface). The calcium nitrate in 5 cases out of 9 produced higher yields of oats than did sodium nitrate, but the difference in no case exceeded 11 per cent. No appreciable difference in the fertilizer effect of the two kinds of nitrates was found either in the trials with oats or with root crops. The calcium cyanamid nearly equaled sodium nitrate in its effect on the crop yields without producing quite as high results. The nitrogen lime produced lower results than the two other nitrogenous fertilizers with oats and carrots, viz., between 64 and 87 per cent of the effect of the sodium nitrate, while with potatoes a 16 per cent higher yield was obtained with this fertilizer than with sodium nitrate. In the case of the highest application of nitrogen lime (150 kg. per hectare), a slight poisoning effect was observed in the young oat plants, from which, however, they soon recovered.

On the influence of nitrites on the development and yield of crops.—The first year's trials (1904) in this series have already been reported (E. S. R., 17, p. 447). The trials during the two following years given here include pot experiments with oats and potatoes. No poisonous effect of the nitrite was to be observed in any case, although from 1 to 20 parts of nitrite per 100 parts of sodium nitrate (with 4 molecules of water of crystallization) was added in different trials. The highest yields of oats were in all cases obtained in the pots to which nitrite had been added, the increase in yield over that obtained with pure sodium nitrate ranging from 6 (20 per cent nitrite, 1905) to 18.5 per cent (10 per cent nitrite, 1904). With potatoes a beneficial effect of nitrites was also observed, viz, an increase in yield of 19.3 per cent when the nitrate was added at the rate of 100 kg. nitrogen per hectare. When only one-half of this amount was applied nearly identical yields were obtained in the case of pots receiving nitrite and those to which no nitrite was applied. An impurity of even as much as 20 per cent of nitrites in the nitrate therefore appeared to act as a stimulant instead of injuring the crops experimented with.

On the content of food materials in root crops at different dates of harvest.—Trials were conducted during three seasons, 1904–1906, with fodder beets, sugar beets, and mangels, samples being harvested twice a month during September to November, and subjected to chemical analysis for dry substance, sugar, and total and albuminoid nitrogen. Out of 10 cases 5 showed a maximum content of dry matter on November 1, 3 on October 15, and 2 on October 1. The maximum and minimum sugar content, as a general rule, corresponded to the dry matter in the roots, while the nitrogen content showed but small and irregular variations in the different samples. The maximum yields of roots and of dry matter, on the other hand, occurred once at October 1, 6 times at October 15, and 3 times at November 1. While the best time of harvesting root crops will vary from year to year with different factors, like character of soil, climatic conditions, kind of seed, etc., it may be said that the results of the trials made so far indicate that the absolute increase in the dry matter of root crops, especially of mangels, under the agricultural conditions of Sweden, is completed about the middle of October, or shortly after this period.

Culture trials to determine in how far the effects of nitrogenous fertilizers depend on the character of the simultaneous phosphatic fertilization.—The strong chemical reaction occurring when certain new nitrogenous fertilizers, especially calcium cyanamid and nitrogen lime, are mixed with superphosphate suggests that the nitrogenous compounds are radically changed in this mixture, and that their fertilizer value might thereby be reduced. Trials with oats grown in glass cylinders filled with sandy soil were therefore made to study this question, a series of cylinders being fertilized with different forms of nitrogenous fertilizers with either superphosphate or Thomas phosphate, one set receiving lime in addition and the other no lime. The results obtained at harvest showed that the superphosphate was in some cases somewhat more, in other cases somewhat less effective than Thomas phosphate. It was not found disadvantageous, therefore, to use the former fertilizer with the new nitrogenous fertilizer materials, like calcium cyanamid or nitrogen lime.

Culture trials with oats and barley to determine in how far the effect of phosphatic fertilizers depends on the character of the simultaneous nitrogenous fertilization.—This is a report of progress in continuation of an investigation commenced in 1905 (E. S. R., 17, p. 1052), precipitated tricalcium phosphate being in this series applied in the place of bone meal for oats, and bone meal applied for barley, instead of for oats as in the first year's trials.

Cooperative fertilizer trials in Malmöhus County, Sweden, 1906, M. WEIBULL and G. NORDIN (*Malmo. Lans K. Hushåll. Sallsk. Kvrtlsskr., 1907, No. 1, pp. 197–265*).—The report contains the usual account of the cooperative fertilizer trials with small grains, roots, and hay crops conducted during the year by the Malmöhus County Agricultural Society at 52 different farms in southern Sweden. The following subjects are discussed in the report: The value of different potash fertilizers for small grains and root crops, trials with calcium cyanamid and nitrate, ammonium sulphate *v.* sodium nitrate for potatoes, and further trials on the effect of artificial fertilizers on the quality of root crops.

Report on cooperative fertilizer trials conducted by the Swedish Moor Culture Association, 1906, A. BAUMAN and H. VON FEILITZEN (*Svenska Mosskul-*

turför. Tidskr., 21 (1907), No. 3, pp. 219–247).—The experiments included trials of soil amendments (sand or clay), liming, fertilizer, and variety tests with small grains, green forage, and root crops.

On the question of the different correlations between lime and magnesia in the nutritive solution (theory of O. Loew), I. Konovalov (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 3, pp. 257–280*).—The author reports studies of this question with barley, millet, oats, and maize. In sand cultures with oats and millet the nutritive solution contained per kilogram of sand 0.584 gm. calcium nitrate, 0.153 gm. mono-potassium phosphate, 0.075 gm. potassium chlorid, 0.184 gm. magnesium sulphate, and 50 mg. of iron as phosphate of iron. The ratios of lime and magnesia varied as follows: $\frac{13.4}{1}$, $\frac{6.7}{1}$, $\frac{3.3}{1}$, $\frac{1.6}{1}$, $\frac{0.8}{1}$, $\frac{0.4}{1}$, $\frac{0}{1}$. The following yields were obtained:

Yields of millet and oats with different ratios of lime and magnesia.

	Total yield of air-dry substance.		Yield of grain.				Yield of straw.		Mean weight of 1,000 normal grains.	
			Millet (6 plants).		Oats (7 plants).					
	Millet (6 plants).	Oats (7 plants).	Normal.	Poor.	Normal.	Poor.	Millet (6 plants).	Oats (7 plants).	Millet.	Oats.
CaO:MgO.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
13.4:1	59.18	45.46	15.08	-------	6.56	3.55	44.11	35.36	5.46	35.24
6.7:1	60.27	63.67	15.09	------	11.06	5.71	45.24	46.90	5.54	39.73
3.3.1	58.73	52.11	15.38	------	12.45	4.64	43.15	35.06	5.34	38.70
1.6·1	51.43	47.91	13.65	0.91	11.30	3.53	37.78	33.17	5.22	37.88
.8.1	41.86	46.12	10.79	1.81	2.67	7.40	31.07	36.02	4.78	35.08
.4:1	31.67	42.01	1.60	2.50	1.65	6.01	30.07	34.35	3.48	33.20
No lime	4.47	25.56	----	--------	.02	3.08	4.47	22.47	--------	24.35

These data clearly show that the more lime there is in the nutritive solution, the quantity of magnesia remaining the same, the greater the yield of both millet and oats, until the ratio of lime to magnesia becomes 6.7 : 1. When this ratio is exceeded the yield of millet decreases somewhat, and that of oats very considerably, there being a falling off in yield of both grain and straw and the mean weight of the grain.

In water cultures with maize and barley the nutritive solution contained per liter of water 1.33 gm. of calcium sulphate, 1.442 gm. potassium nitrate, 0.434 gm. dicalcium phosphate, 0.206 gm. magnesium chlorid, and 100 mg. iron as phosphate. The following yields were obtained:

Yields of maize and barley with different ratios of lime and magnesia.

	Total yield.		Yield above ground.		Yield of roots.	
	Maize (3 plants).	Barley (6 plants).	Maize (3 plants).	Barley (6 plants).	Maize (3 plants).	Barley (6 plants).
CaO:MgO:	*Grams.*	*Grams*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
13.3:1	6.37	13.89	4.87	10.49	1.50	3.40
6.7:1	7.55	12.85	6.35	11.30	1.20	3.83
3.3:1	8.40	16.56	6.83	17.85	1.57	2.76
1.6:1	8.69	20.61	7.27	14.49	1.42	2.07
.8:1	9.61	18.18	8.25	11.32	1.36	1.53
No lime	.20	.34	.12	.31	.08	.03

The maximum yield of organic matter was obtained in case of barley when the ratio of lime to magnesia was 3.3 : 1 and in case of maize when the ratio

was 0.8:1. The same ratios gave the maximum yield of above-ground material. For the development of the roots of barley the best ratios were 6.7:1 and 13.3:1 and for that of the roots of corn the best ratio was 3.3:1.

The author also describes sand cultures with barley which did not give any decided results.

Some chemical and bacteriological effects of liming, E. B. VOORHEES, J. G. LIPMAN, and P. E. BROWN (*New Jersey Stas. Bul. 210, pp. 79*).—The physical, chemical, and bacteriological or physiological effects of liming are briefly explained, and experiments are reported to test the effect on the growth of oats and crimson clover and on the development of certain groups of soil bacteria of equivalent quantities of magnesian (dolomite) and nonmagnesian (oyster shell) lime in the burned and carbonate state, with or without the application of nitrogen (dried blood), potash (sulphate), and phosphoric acid (acid phosphate), in case of oats, and of potash and phosphoric acid only in case of crimson clover.

The experiments were made in rectangular galvanized sheet-iron boxes 12 in. long, 10 in. wide, and 11 in. deep, each box containing 50 lbs. of soil. Two kinds of soil were used, (1) a somewhat sandy loam used for market-garden crops, and (2) a typical red shale soil rather poor in available plant food used for general farm crops.

"The crop returns showed that the application of lime reduced, in many instances, the yields of dry matter, but increased, on the whole, the yields of nitrogen. The bacteriological studies showed that both ammonification and nitrification were promoted by the previous liming of the box soils, hence it is quite clear that the depression in the yields of dry matter was not due to lack of nitrogen but to some other cause. The crop returns show, likewise, that the depression in the yields of dry matter was greater where magnesian lime was applied than it was where nonmagnesian lime was applied. The bacteriological methods show that, in the greater number of instances, both ammonification and nitrification were promoted by the magnesian lime to a more marked extent than they were promoted by nonmagnesian lime. Hence it appears again that the depression in the yields of dry matter was not due to a decreased supply of available nitrogen."

The causes of the depression noted are briefly considered and are to be more fully discussed in a future publication.

As regards the effect of the different fertilizer mixtures it was observed that "the application of acid phosphate, potassium sulphate, and dried blood, in the case of the oats, and of acid phosphate and potassium sulphate, in the case of the clover, increased the yield of dry matter, nitrogen, and ash." The magnesian lime proved inferior to the nonmagnesian lime, the latter slightly increasing the yield of dry matter, considerably increasing the yield of nitrogen, and decreasing the yield of ash, while the former decreased the yield of dry matter, increased the yield of nitrogen in the oats and decreased it in the clover, and decreased the yield of ash in both cases.

An application of 1,000 lbs. of lime per acre was practically as efficient in case of oats as an application of 2,000 lbs. In case of clover the larger application gave better results. Lime in the form of carbonate produced more dry matter, nitrogen, and ash than burned lime. In promoting ammonification the magnesian lime was superior to the nonmagnesian lime in bare and clover soils, but inferior in the oat soils. Applications of 2,000 lbs. were superior to 1,000 lbs. for this purpose in the bare and oat soils and inferior in the clover soils. The carbonate was superior to the oxid in bare soils and inferior in the oat and clover soils. The ammonification coefficient was increased by the application of minerals. Nitrification was promoted by the application of the fertilizing materials, but the results obtained in culture tests were only in part confirmed in the pot experiments.

The results of the studies of nitrogen fixation were quite irregular, but agree in general in indicating that the addition of fertilizing materials increased nitrogen fixation and that carbonate of lime favored nitrogen fixation to a greater extent than burned lime.

The bacteriological processes were apparently more active in the sandy loam soil than in the red shale soil.

Experiments on the liming of meadow land, E. PORTER and R. C. GAUT (*County Council Lancaster, Ed. Com., Agr. Dept., Farmers' Bul. 1, pp. 9*).—Experiments on manured and unmanured grass lands are briefly reported. The results show that ground limestone was more profitable as an application to grass lands than burnt lime and can be economically used on grass lands which are in need of lime.

Inspection of commercial fertilizers, H. D. HASKINS, E. T. LADD, and W. E. DICKINSON (*Massachusetts Sta. Bul. 119, pp. 64*).—This is the usual report of results of fertilizer inspection during the season of 1907, including also notes on methods of sampling, descriptions of the different classes of fertilizers examined, trade values of fertilizing ingredients, and explanations of commercial and agricultural values, and the text of a recent amendment to the fertilizer law of 1896. This amendment gives the station authority to state the dealer's cash price per ton of fertilizers, the value per ton of the ingredients of the fertilizers, and the percentage difference between dealer's price and valuation.

Analyses and valuations of commercial fertilizers and ground bone, C. S. CATHCART, V. J. CARBERRY, and J. GAUB (*New Jersey Stas. Bul. 208, pp. 34*).—This bulletin supplements Bulletin 206 of the stations (E. S. R., 19, p. 526) and reports analyses of fertilizers made during that portion of the year not covered by the previous bulletin.

The total number of samples of fertilizing materials examined during the year was 666, of which 482 were factory-mixed fertilizers representing the product of 96 establishments. Forty-nine per cent of the brands examined were deficient in one or more of the elements of plant food guaranteed. The largest number of deficiencies was in available phosphoric acid. Attention is called to the fact that the value of nitrogen in nitrates was 2 cts. a pound higher in 1907 than in 1906, of nitrogen in organic matter 2 to 2½ cts. per pound higher, while in case of sulphate of ammonia the price remained unchanged. Water-soluble and citrate-soluble phosphoric acid increased ½ ct. per pound and the cost of various forms of potash remained unchanged.

The fisheries of Alaska in 1906, J. N. COBB and H. M. KUTCHIN (*Dept. Com. and Labor [U. S.], Bur. Fisheries Doc. 618, pp. 70*).—This report contains statistics and observations on the fisheries and fishery resources of Alaska based upon the annual inspection of the Bureau of Fisheries. A section of the report deals with the possibility of using cannery waste and fish not fit for food in the preparation of fertilizers. It is stated that but one concern is at present engaged in this business. The desirability of stringent laws and regulations preventing the use of food fish in the preparation of fertilizers is pointed out.

AGRICULTURAL BOTANY.

The influence of the humidity of the air on the preservation of seed, E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 24, pp. 1194-1196*).—The author placed a large variety of seeds in vessels containing air in varying proportions of saturation, i. e., complete saturation, and 0.8, 0.7, 0.5, 0.3, and 0.13

of saturation, and in absolutely dry air. The seeds were examined from time to time, and the results are given in detail.

In saturated air the seeds were found to deteriorate rapidly, and after 3 months practically all were dead. Where the degree of saturation was 0.8 the seeds preserved their vitality longer, but all were dead at the end of 6 months. Where the saturation was 0.7, which corresponds to the average of the air at Paris, there was practically no change in the seeds during the first month, but at the end of the second month the parsnip seed was dead, while 75 per cent of the poppy and digitalis, 20 to 30 per cent of the beans, lentil, clover, buckwheat, oats, tobacco, carrot, and campanula, and 5 to 10 per cent of the other seeds had been destroyed. After 3 months the losses were still greater, and at the expiration of 6 months all the seed of beans, clover, buckwheat, oats, and onion were dead, and nearly all of the lettuce, 90 per cent of the barley, 80 per cent of the poppy and campanula, 75 per cent of the carrot and cabbage, 60 per cent of the wheat and beets, 50 per cent of the lentil and rice, slightly less than 50 per cent of the tobacco, and 30 per cent of the cress and lupine had been destroyed. At the expiration of 9 months the seeds of lettuce, campanula, and poppy would no longer germinate, while for the other species mentioned a further loss of about 5 per cent had taken place. The depreciation in the other samples is also described.

In conclusion it is shown that at a temperature of 25° with a saturation of 0.7 many grains lose their vitality rapidly. The Cruciferæ are among the most resistant. In less humid atmospheres the germination is retained longer, although there is some loss for certain species, even when the lowest saturation is employed. The case of rice is particularly noted. It is stated that in the rice beds it is customary to germinate the seed under a layer of water, but the author did not find the rice much more resistant than other grains to very humid atmospheres. In this connection he verified the experience of Takahashi, showing that in the absence of oxygen, whether in a vacuum or the oxygen removed by an alkaline solution of pyrogallol, the rice would germinate whenever placed in contact with water.

A study of the proteolytic changes occurring in the Lima bean during germination, S. Suzuki (*Jour. Biol. Chem., 3 (1907), No. 4, pp. 265-277*).—In order to determine somewhat more definitely the proteolytic changes which take place during germination of seed, the author carried on a series of experiments with Lima beans, in which a number of beans of approximately the same size and ripeness were selected, and one portion analyzed while the remainder were placed in sand, kept moist, and allowed to germinate in darkness. After 6 days of growth in darkness, specimens were taken for analysis, and of the seedlings remaining part were placed in the sunlight and the remainder left to grow in darkness. At the end of 12 days the etiolated and green plants were subjected to analysis.

In the cotyledons it was found that all the proteids except the peptones showed a decrease at the 6-day and 12-day stages of growth. Peptones, diamino bodies, monoamino bodies, and ammonia showed an increase at the 6-day stage, after which there was a decrease, especially in the cotyledons of the green plants. The increase in these substances is believed to be due to the decomposition of higher proteids. The decrease of all nitrogenous substances in the cotyledons examined at the 12-day stage of growth is believed to be due to translocation into the stem.

In the stems of plants grown 12 days in darkness all the nitrogen compounds showed an increase, with the exception of the diamino bodies, in comparison with those of the 6-day etiolated plants, and there was a remarkable increase of insoluble proteids.

It appears evident that the formation of insoluble and coagulable proteids is more active in sunlight than in darkness, causing a decrease of albumoses, peptones, and diamino compounds.

On the variation in the dry weight of plants under different light intensities, W. Lubimenko (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 24, pp. 1191–1194, dgm. 1*).—In a previous publication (E. S. R., 19, p. 22), the author has shown that the optimum illumination for the assimilation of organic materials by germinating plants is somewhat below that of the optimum for photosynthesis. These studies suggested an examination of the relation between illumination and increase in dry weight of green plants. By means of specially constructed frames, the author carried on experiments with 12 species of plants, analyzing samples every 10, 15, 20, and 30 days to determine their fresh and dry weight.

In 34 experiments, in all but 7 cases the maximum dry weight was secured where the light intensity was less than that of full summer sunlight. In practically every case there was a gradual increase in dry weight up to a certain degree of illumination, after which a marked falling off was noted.

The injurious effect of prolonged exposure to very strong light is attributed to the retarding effect the light has upon certain organic materials which result from the decomposition of carbon dioxid by chlorophyll.

The action of a magnetic field of high frequency on Penicillium, P. Lesage (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 25, pp. 1299, 1300*).—A study was made of the germination of spores and the growth of mycelium of Penicillium in a magnetic field of high frequency. It is claimed that germination and growth were accelerated, but that the action was probably indirect and due, in part at least, to the heating of the solenoid.

Influence of stimulating compounds upon the crops under different conditions, S. Uchiyama (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1* (*1907*), *No. 2, pp. 37–79, pls. 4*).—Plat and pot experiments in which the stimulating effect of manganese sulphate at rates of from 10 to nearly 40 kg. per hectare, as well as of iron sulphate, iodin, and fluorin on a great variety of crops under varying conditions of acidity and alkalinity of the associated fertilizers and in the character of the soil was studied, are reported.

The results show that both the manganese and the iron compounds stimulated the growth of crops, the action of the salts varying considerably with the character of the plant. In some cases joint application of the manganese and iron salts gave better results than either salt alone. In other cases the opposite result was observed. As a rule the manganese sulphate gave better results than the iron sulphate, but its action varied greatly with the character of the soil, the method of application, and the nature of the associated fertilizing materials. The best results were obtained when the manganese sulphate was applied as a top-dressing and in fertilizer mixtures which had a nearly neutral reaction. Applications of from 20 to 50 kg. of crystallized manganese sulphate per hectare (18 to 45 lbs. per acre) are considered sufficient.

The stimulating effect of potassium iodid and sodium fluorid varied widely with different plants. From 25 to 500 gm. of potassium iodid and 100 to 1,000 gm. of sodium fluorid per hectare are considered suitable applications of these materials.

The toxicity of the salts of chromium, aluminium, and magnesium in comparison with similar properties of some rare metals, A. Hébert (*Bul. Soc. Chim. France, 4. ser., 1* (*1907*), *No. 18–19, pp. 1026–1032*).—A study was made with the sulphates of chromium, aluminium, and magnesium to determine their relative toxicity, and comparisons were made with similar salts of some of the rarer metals, as zirconium, thorium, cerium, lanthanum, etc. The effects of increasing amounts of the different compounds were tested on fish, germinated seeds of peas, wheat, and rape, *Aspergillus niger*, yeasts, and various soluble ferments, such as diastase, emulsin, etc.

The toxicity of the different compounds varied slightly on the different groups of subjects, but in general occurred in the following diminishing order: Zirconium, thorium, aluminium, chromium, cerium, lanthanum, and magnesium. Zirconium, thorium, aluminium and chromium were found strongly poisonous, the degree depending on the acidity of their solutions, while cerium, lanthanum, and magnesium are said to be variable in their poisonous action, often being almost wholly noninjurious.

Seed and soil inoculation, W. B. Bottomley (*Gard. Chron., 3. ser., 42 (1907), Nos. 1093, pp. 385, 386, figs. 3; 1094, p. 416; 1095, p. 430, figs. 3*).—The author, after describing the symbiosis occurring between bacteria and various leguminous plants, calls attention to the beneficial effect in the increased yield of crop and the increase in fertility of the soil due to the presence of these organisms. He also gives the results of a series of experiments in which crops other than leguminous ones were grown under the influence of bacterial cultures.

It is stated that it was found possible to cultivate a special race of nitrogen-fixing bacteria in tomato-root extract and prepare therefrom a culture solution which when sprinkled on the roots of tomato seedlings caused them to grow much more vigorously, and that the inoculated plants were the only ones to ripen their fruits. Strawberries similarly treated produced 45 per cent more fruit and the fruit ripened 10 days earlier than with noninoculated plants. The experiments with wheat and barley are also said to be promising, but these are not yet reported upon.

Results of soil inoculation (*Country Life [London], 22 (1907), No. 557, pp. 358, 359*).—The results of practical tests in different localities of cultures prepared by Professor Bottomley are summarized.

On the influence of nectaries and other sugar-containing tissues in the flower on the opening of the anthers, W. Burck (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 9 (1906), pt. 1, pp. 390-396*).—Attention is called to the fact that the opening of the anthers in many flowers is preceded by a very considerable loss of water, and that with many plants this opening takes place within a closed flower and the loss can not be caused by transpiration. The observation of this fact gave rise to the question whether perhaps the nectaries or other sugar-containing tissues in the flower have an influence on the withdrawal of water from the anthers.

A large number of flowers were examined under varying conditions and the experiments indicate that the water is withdrawn from the anthers by the osmotic action, having its origin in the glucose-containing tissues. This enables the stamens to bring their pollen to the surface at the right time, independent of the hygroscopic conditions of the air.

On the formation of flowers after frost, G. Daikuhara (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 1-6, pls. 3*).—The author reports observing injury to mulberry trees by severe frosts early in May, and that following the destruction of the leaf buds, panicles containing flowers appeared in abundance. Attention is called to a statement of Loew that a certain concentration of sugar in the plant juice is a necessary condition for flower formation, and the author offers this as an explanation for the abundance of flowers following frosts. It appears that the development of young leaves had drawn considerably on the stock of reserve protein in the neighboring parts of the bark, resulting in a solution richer in sugar, and the dry weather before and after frost favored the flower formation by a further concentration of the cell sap.

A contribution to the knowledge of the formation of callus and wound tissues on ringed twigs, A. KRIEG (*Beiträge zur Kenntnis der Kallus- und Wundholzbildung geringelter Zweige. Würzburg, 1908, pp. 68, pls. 25*).—The results are given of an anatomical study of the development and growth of callus and wound tissues on a number of girdled twigs. The subjects studied were grapes, ampelopsis, roses, willows, cornel, syringa, poplar, and horse-chestnut. The formation of wound cork and wood and their absorption and fusion are described, as are also the effects of ringing on the leaves, the presence of crystals in new tissues, etc.

The Indian cottons, G. A. GAMMIE (*Mem. Dept. Agr. India, Bot. Ser., 2 (1907), No. 2, pp. 23, pls. 14*).—The results of a botanical study of the cultivated varieties of Indian cottons are given, and keys are presented to the species, varieties, and subvarieties of those recognized by the author. Nine distinct species are recognized and a number of forms and varieties of each are described.

Variations in poppies, L. BLARINGHEM (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 25, pp. 1294–1296*).—The results of a study of an isolated colony of poppies (*Papaver rhœas*) are given in which the author shows that marked variations have been developed by the different plants. In all some 14 series are recognized in a colony of about 250 individuals, and the author believes that these plants are in a state of mutation, a hypothesis which he proposes to investigate by a study of their seedlings.

FIELD CROPS.

The New Jersey salt marsh and its improvement, J. B. SMITH (*New Jersey Stas. Bul. 207, pp. 24, pls. 2, figs. 4, map 1*).—The territory covered by the New Jersey salt marsh and the conditions obtaining therein, together with the improvement work carried out and in progress are described, and the effect of drainage on crops in certain areas is pointed out. The two recognized methods of reclaiming salt marshes, diking and drainage, are outlined.

"Diking means, briefly, keeping out all sea water by means of dams and by means of gates or otherwise, allowing the water that accumulates behind these dams to escape at low tide. Drainage means simply a provision for getting rid of the surface water on a marsh by means of ditching and thereby improving its texture and the value of its crops. It is not reclamation, strictly speaking, for it preserves the marsh as such, and the land keeps its characteristic crops. It is reclamation only in the sense that mosquito-breeding places are eliminated and its productive power is increased."

Experiment station reports, E. A. NOBBS (*Agr. Jour. Cape Good Hope, 31 (1907), No. 4, pp. 414–434*).—This is a report of experiments carried on in the Robertson district.

The results of manurial experiments with cereals show that for wheat a complete fertilizer is most profitable. The normal quantities of the different fertilizers used per acre were as follows: Superphosphate, basic slag and guano each 100 lbs., nitrate of soda 80 lbs., and sulphate of potash 40 lbs. These were applied in different combinations and quantities. The use of one and one-half times the normal dressing gave the best results. The three chief plant foods used singly were of but little value. In these experiments superphosphate gave much better results than basic slag, but it is pointed out that this is not always the case. As a result of comparing home-mixed with ready-mixed fertilizers it is concluded that the most profitable application is to be obtained by buying the several ingredients and combining them in such proportions as have been found to answer best.

A complete fertilizer application also gave the best results in the tests with barley, guano proved superior to barnyard manure, and, as with wheat, superphosphate was more satisfactory than basic slag. The use of the normal application of the complete fertilizer was very profitable as compared with the use of proprietary fertilizers.

Rye gave the best yield when only phosphates and nitrate of soda were applied. Double the normal quantities gave the most pronounced results. Superphosphates again gave better yields than basic slag, but the difference was not so marked as in the tests with wheat and barley.

In growing a crop of oats for hay a dressing of 200 lbs. of superphosphates, 160 lbs. of nitrate of soda, and 80 lbs. of sulphate of potash per acre gave a crop 624.53 per cent heavier than that of the average of unmanured land, which produced only 1,345 lbs. of oat hay per acre as compared with 8,400 lbs. for the doubled normal application, 5,990 lbs. for the one and one-half normal, and 4,790 lbs. for the normal dressing.

The variety tests with wheat apparently brought out the superiority of 4 Australian hybrid wheats, Darling, Jonathan, Gluyas Early, and Budds Early. These varieties also proved fairly rust and drought resistant. Cape barley and Scottish Chieftain were the leading varieties of barley under test.

A cultural test with alfalfa indicated that rolling immediately after sowing is a good practice, while rolling a few days after sowing and before the seed is up seemed to be injurious. Rolling the strongly growing young crop had a better effect than rolling the very young plant.

Potato experiments resulted in better yields from whole tubers averaging 1¼ oz. each than from whole tubers averaging 3 oz. each, the difference in yield per acre being 620 lbs. Planting potatoes on ridges gave a yield of 7,741 lbs. per acre, as compared with 5,625 lbs. for level planting. Ridge planting seemed to give better results when the drills were 24 or 27 in. apart, while at the distance of only 21 in. between the drills the level planting was most satisfactory. The Early Rose was grown in these experiments. In a test of 20 varieties, Beauvais Institute, Epicure, Ninety-fold, Eldorado, and Northern Star gave the best results. The yields for these 5 varieties, however, ranged from 2,155 to 4,440 lbs. of tubers per acre.

Cultural tests with a number of grasses and leguminous forage crops are reported. A crop known as N'youti from Rhodesia proved superior to any imported forage crop, especially under very dry conditions. The November sowing of this plant yielded 8,160 lbs. of hay per acre. While all the crops gave good yields, N'youti and Yellow Milo maize were exceptionally successful. The Coffee cowpea developed a great mass of leaf over 3 ft. high and yielded 650 lbs. of clean seed to the acre, while New Era was of smaller growth, but yielded 960 lbs. of seed per acre. It is noted that Zwartbek or Catjering boontje and the Kafir bean are two forms of the cowpea. Good yields are also reported from Thousand-headed kale and rape.

The influence of different fertilizer treatment on the structure of the stem in the Gramineæ, J. KISSEL (*Ber. Oberhess. Gesell. Nat. u. Heilk. Giessen, n. ser., Naturw. Abt., 1 (1904–1906), pp. 43–85, pl. 1, dgms. 2*).—Oats, meadow foxtail (*Alopecurus pratensis*), and French rye grass (*Avena elatior*) were treated with different quantities and combinations of fertilizers, and the influence of such treatment on the structure of the stems of the plants in its relation to their strength was studied. It was found that the use of phosphoric acid thickened the cell wall and decreased the lumen, and thereby made the structure of the stem considerably denser. The effect produced by phosphoric acid was most marked in the bast and pith cells and no less so in the epidermal cells. This substance counteracted the weakening effect of nitrogen and lime, but beyond this point no strengthening action was observed. Superphosphates had the greater influence on the reduction of the cell lumen and Thomas slag on the thickening of the cell wall, but no great difference in the density of the stems as resulting from the use of these substances was noticeable.

The application of nitrogen, on the other hand, reduced the thickness of the cell wall and enlarged the cell lumen. This effect was most apparent in the pith cells, to a lesser extent in the bast cells, and only to a small degree in the epidermal cells.

The use of potash as a fertilizer seemed to have no definite effect on oats, but in the case of the grasses, especially the French rye grass, its effect was weakening, as shown by the reduced thickness of the cell wall and the increased size of the lumen. No difference in effect was observed when kainit or 40 per cent potash salt was used.

The influence of lime was the same as that of nitrogen but not so marked. No weakened condition of the stem could be determined, because the stems of the plants heavily supplied with lime did not attain the proper size.

The influence of the different fertilizing substances varied between the wider limits in the case of thick cell walls and wide lumina than in the case of thin cell walls and narrow lumina. The complete normal application of fertilizers was of greater advantage to the cell structure in the plants than the complete heavy applications.

The influence of nitrogenous, phosphatic, and potassic fertilizers upon the percentage of nitrogen and mineral constituents of the oat plant, M. H. PINGREE (*Pennsylvania Sta. Rpt. 1906, pp. 43–53*).—The composition of oat crops grown in 1904 was studied to determine the influence of fertilizer constituents on the composition of the plants, the nitrogenous and ash constituents of the crops being particularly considered. The fertilizer applications consisted of dried blood, dissolved boneblack, and muriate of potash and were in quantities supplying 24 or 48 lbs. of nitrogen, 48 lbs. of phosphoric acid, and 100 lbs. of potash per acre. Nitrogen and potash alone applied to the preceding corn crop produced but trifling gains by their residual effects upon the oats, while phosphoric acid alone and a complete application produced gains of approximately 25 and 60 per cent, respectively, over the yields given by the unfertilized land.

It was found that when the mineral fertilizers were associated with nitrogen a larger absorption of ash materials from the soil per unit weight of crop produced took place than where the land had been cropped for years without any manurial treatment, and that where dried blood was used alone there was a larger production of crop per unit of ash taken up than with any other treatment. Where nitrogen was applied alone more was taken up per unit of dry matter formed than in any other case. The proportion was distinctly less from the crop on the unfertilized plat, and still lower where potash alone was used. Where phosphoric acid was used even in a complete fertilizer the proportion of nitrogen was greatly depressed, so that in this soil the phosphoric acid promoted the highest economy in the use of nitrogen for the production of the organic substances in the oat plant. There was a smaller proportion of nonalbuminoid nitrogen where nitrogen was applied as a fertilizer with or without phosphoric acid than where no nitrogen was applied, except in the case of the potash manuring. The differences in composition are not regarded as sufficiently pronounced to suggest important differences in physiological activity under the several systems of fertilization.

*In studying the composition of ash it was found that where muriate of potash was used alone there was a large increase in the proportion of potash in the ash of the straw and a very distinct increase in that of the grain. Where muriate of potash formed part of the complete fertilizer the results with reference to the straw were the same but the elevation of chlorin was less pronounced. In the case of the grain ash, muriate of potash had less influence upon the composition than other constituents. The use of dissolved phosphate apparently caused a pronounced increase in the proportion of phosphoric acid in the ash of both grain and straw, while the influence of the associated sulphuric acid was not reflected in any distinct elevation in the percentages of this constituent in the ashes of the crops treated with the phosphate, nor was the lime present in these ashes in so large a proportion as in the ashes of crops otherwise treated. While the major portion of the mineral matters in dissolved boneblack consists of calcium sulphate, and it therefore might be supposed that the lime and sulphuric acid in the ash would exhibit some change in proportion as the phosphate was applied, no direct influence was detected in the composition of the ash of either the grain or the straw. The use of the potash and the complete fertilizer indicated a marked relative decrease of silica, the maximum percentage of this constituent appearing in the ash from the unmanured crop. The proportion of phosphoric acid to total dry matter was slightly increased by the use of even the nonphosphatic fertilizers, but where phosphates were used the increase was very much more marked. It is concluded that on this soil the use of potassic fertilizers has a lesser influence on the composition of the grain than the use of phosphatic fertilizers, but that its effects upon the composition of the straw are almost as marked as those of the phosphates.

From determinations of the actual amounts of fertilizer constituents removed it is shown that nitrogen applied alone slightly increased nitrogen consumption and depressed potash consumption, that potash alone greatly increased potash consumption and slightly depressed nitrogen consumption, and that phosphoric acid applied alone led to the consumption of nearly double the quantity of phosphoric acid used by the unfertilized crop and also to the consumption of distinctly greater quantities of nitrogen and potash. Neither the use of nitrogen nor of potash alone had a marked influence on the phosphoric acid consumption. The use of the complete fertilizer led to an increase in the consumption of each of the three constituents in amounts greater than the algebraic sum of the increases caused by the use of nitrogen, phosphoric acid, and potash singly. As a one-sided fertilization has been continued for almost 25 years upon these plats, the conclusion that the complete fertilizer is most productive and economical under all circumstances is not considered warranted.

A method of breeding early cotton to escape boll-weevil damage, R. L. Bennett (*U. S. Dept. Agr., Farmers' Bul. 314, pp. 30, figs. 16*).—This bulletin is based upon the results of 4 years' investigations, which show that by seed selection early and rapid fruiting and productiveness in cotton may be developed and maintained, and that by this method weevil damages may be prevented or reduced. The type recommended for early and rapid fruiting and for productiveness to escape the boll weevil is described as follows:

"The first fruit limb must be low, not higher than the fifth or sixth joint above the seed-leaf joint. The wood or primary limbs must be low, and it is desirable that they should not exceed four in number. The first limb should not be higher than the fifth or sixth joint above the seed-leaf joint. The joints in the main stem, in the fruit limbs, and in the primary limbs must be short, not exceeding 1 to 3 in. in the lower part of the plant. Fruit limbs should grow at the successive joints of both the main stem and the wood limbs. Fruit limbs should be continuous in growth for continuous fruiting until the plant is matured. The largest leaves should not be wider than 5 or 6 in. across at right angles to the midrib."

It is pointed out that large bolls facilitate picking, reduce the amount of trash gathered with the cotton, and are also storm resistant. It is stated that about 38 per cent of lint was the general yield of a few varieties that gave the highest percentage. It is believed that by selecting for lint as much as 40 per cent may be made to grow regularly and on a seed of good size and in a large boll.

The yield of progeny rows of cotton plants in selection tests varied from 24¾ to 45 lbs., and averaged at the rate of 1,854 lbs. per acre, while the yield of common seed was 1,630 lbs., or a difference of 224 lbs. per acre in favor of seed from selected plants. The seed of the best yielding progeny rows planted in 1907 produced plants true to the type and characters of the parent progeny rows and to the original parent plant of each. It was observed that in breeding early cottons some strains matured their plants extremely early and shed their foliage a considerable time before frost. The advantage of early defoliation is that the weevils are deprived of food and places for propagation.

In another experiment selections were made of King and Jones cotton and of an unknown variety. These cottons were grown on very rich river bottom land and the stalks were from 7 to 9 ft. tall. Plants of the King and Jones varieties from 2½ to 3 ft. in height and very full of open bolls were also found. The seeds of these two selections were planted the next year and the crops compared. The progeny of the small King plants grew 2 ft. high and that of the large King plants 3¾ ft. high, while the progeny of the Jones variety from the small plants reached a height of 2¼ ft., and that from the large plants 3¼ ft. The small progeny plants were more fruitful than the large ones. It is concluded that by selecting from very small and fruitful plants the size of plants on either bottom land or upland may be limited and the productiveness increased. A brief note is given on the crossing or hybridizing of cotton.

Experiments and observations on the planting of cotton are reported. On March 20, 1906, 20 acres were planted, the seed being covered with about 2 in. of soil. A moderately heavy rainfall followed by a few days of cold weather destroyed all the seed and the field was replanted on April 10, the seed being covered from ½ to ¾ in. At the same time 6 acres were planted and the seed covered about 2 in. The best stand was obtained where the seed was lightly covered. Although April, 1907, was colder than March, seed planted at the rate of 1 lbs. per acre and covered not over ¾ in. in depth made a perfect stand and lived. In 1906 it was observed that on a loose soil many young cotton plants died, while on a firm seed bed all the plants lived. In 1907 selected seeds, hand-dropped and scarcely covered, made a good and satisfactory stand on 3 acres of land, although this planting, made on April 12, was followed by 2 weeks of cold and rain. It is suggested that in order to succeed in shallow covering and keeping a stand in early planting, the seed bed should be firm and clean, the soil of the beds harrowed before planting and cultivated shallow, while the seeds are coming up, if necessary, and as often thereafter as moisture permits, and that a planter with a gage wheel in the rear to regulate the depth of planting and press the seed into the soil be used.

Raising Egyptian cotton, L. M. IDDINGS (*Daily Consular and Trade Rpts.* [*U. S.*] *1907, No. 3043, pp. 6, 7*).—The cost of growing cotton in the Delta in the Santa district, Scharbieh province, on a farm of 207 feddans (about 215 acres), was $40.35 per acre. The cost of production per pound of cotton was 7½ cts., and the value of the crop per acre $113.27. The itemized cost is shown in tables.

[Variety tests of cotton and of corn], M. V. CALVIN (*Georgia Sta. Circ. 65, pp. 4*).—Tables are given showing the results of these tests, together with lists of persons from whom cotton seed and seed corn may be purchased.

Hay crops of the United States, 1866–1906, C. C. Clark (*U. S. Dept. Agr., Bur. Statis. Bul. 63, pp. 34*).—This bulletin presents in tables a compilation of statistics on the hay crop of the different States and for the different years for the period 1866–1906.

Improving the quality of domestic hops, W. W. Stockberger (*Washington, D. C.: Govt., [1907], pp. 12*).—A paper read at the New York meeting of the American Brewing Institute, which points out the opportunity for improving our domestic hops by curing at lower temperatures, by study of the nature and conditions of resin formation, by the breeding of disease-resistant races, by selection of the best and most productive types, and by the breeding of pure pedigreed races.

Biological studies on the green and brown color in the grain of rye, E. Gross (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 9, pp. 712–721, dgm. 1*).—Breeding experiments with rye have been in progress for 10 years and the results have shown that the green as well as the brown color in the grain is readily transmitted. In summarizing the data and considering the results from the green colored strains as 100, the author found the following values for the brown grained strains: Length of straw 103.97, number of kernels per plant 107.72, weight of plant 112.92, weight of grain per plant 112.98, weight of straw and chaff per plant 112.87, individual kernel weight 107.69, weight of heaviest head 110.94, number of grains in the heaviest head 106.45, weight of grain in the heaviest head 112.84, and individual weight of the grains in the heaviest head 102.38.

Distance experiments with sugar beets, J. Bukovansky (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 12, pp. 877–895*).—The yields of sugar beets increased with the width of the rows up to 45 cm. The best distance between the beets in the row was from 25 to 30 cm., the quality of the beets improving as the distance between beets in the row decreased. The absolute leaf weight and the relation of the root to the leaves was reduced by close planting and the beets were richer in sugar.

Experiments in growing Sumatra tobacco under shelter tent, 1904, W. Frear (*Pennsylvania Sta. Rpt. 1906, pp. 29–42, pl. 1*).—Earlier work in this line has been previously reported (E. S. R., 17, p. 552).

In 1904 about 50 sq. rods were covered by a shelter tent at a cost of $160.41 and it is estimated that under present conditions the cost for tenting an acre of land will exceed $400. The land was plowed on June 6 and thoroughly cultivated, the last harrowing being given on June 15. A homemade fertilizer mixture of 450 lbs. of cotton-seed meal, 67 lbs. of carbonate of potash, and 233 lbs. of dissolved South Carolina rock was applied. The tobacco beds were prepared early in April and the tobacco was planted in the field on June 15. The growing season from June through August was on the average somewhat cooler than usual and the rainfall was considerably below normal. From June 16 to 30, 1.88 in. of rain fell, in July 3.87 in., in August 5.29 in., and from September 1 to 15, 2.82 in.

The crop was hoed and harrowed on June 27, July 6 and 18, topped August 1, 8, and 19 and suckered August 15, 27 and September 5. The lower leaves were primed September 5, those next in position September 13, the third lot September 21, and the last September 26. From the time of planting up to the first priming 82 days elapsed, and to the last priming 103 days. The sum of the mean daily temperature up to the first priming was 5,900° and up to the last priming 7,227°. The cost of producing the leaf ready for sweating, exclusive of the items of rent for land and curing shed, of the interest on the shelter, and attendance during curing was $186.30. The leaves were cured without the aid of artificial heat and cured uniformly to a fine light color.

In another experiment one-sixth of an acre was under shelter. The land, which had had no cover crop during the preceding winter, was thoroughly cultivated early in spring and fertilized just before planting with 500 lbs. of commercial fertilizer rich in organic nitrogen, sulphate of potash, and acidulated bone. The tobacco was planted June 9 and 14, cultivated July 29, hoed July 1, 14, 16, 28 and 30, and topped and suckered on July 27 and August 11 and 13. The leaf was ready for priming September 1, 2, 7, 12, 17 and 19 and the harvesting was finished September 21. The curing was done in the same manner and as satisfactorily as in the previously described work, and the tobacco was taken down December 27 and 28 and sorted for sweating. The temperatures during the bulk sweating and the dates on which the bulks were turned are given. At no time during the process of fermentation was the temperature allowed to go over 112° F. The sizing and the sorting of the crop was begun on February 15. The total weight of leaf submitted for sweating was 418 lbs. and the weight after sorting and finishing sweating 409 lbs.

In the Marietta crops of 1902 and 1903, 43 and 41 per cent respectively was second-quality leaf, while the first experiment here described showed but 22 per cent and the second about 35 per cent of this grade. The luster of the two crops of 1904 was little, if at all, inferior to that of the average imported Sumatra wrapper used in the Lancaster County cigar factories, but it was not so good as that of the best Sumatra wrapper. In the first experiment the yield was at the rate of 908 lbs. per acre, of which 708 lbs. were of first-quality wrapper. It is estimated that the cost of the leaf produced in these experiments ranged from 92 to 97 cts. per pound.

The experiments here reported are considered as indicating in general the possibility of growing from seed of the Sumatra strain under shelter on the light, sandy type of soil in northern Lancaster County a wrapper leaf approaching in quality the average imported Sumatra with respect to color, luster, fineness of vein, wrapping capacity and burn. It is further stated that the yield per acre in relation to the cost of production and the selling price of the leaf is sufficiently large to make shade culture profitable, but attention is called to the fact that since the results are of but a single season's test they do not afford a safe basis of judgment with respect to yield and quality during an average season in that locality.

The tobacco industry in the United States, M. Jacobstein (*Columbia Univ. Studies Polit. Sci., 26 (1907), No. 3, pp. 208*).—This work gives a historical survey of the tobacco industry, including the colonial period and the period from 1776-1860. The time from 1860-1905 is considered the modern period of the industry and under this heading are discussed consumption, cultivation, manufacture, the tobacco trust, labor conditions in the tobacco industry, foreign trade, and the tobacco tax.

Tobacco ash (*Meded. Deli-Proefstat. Medan, 1 (1907), No. 6, pp. 192-204*).—The chemical composition of tobacco ash was studied with a view to determining its value for fertilizing purposes. The data secured in analyzing numerous samples of ash show that in many cases when the potash content is high the chlorin content is also high, ranging from 2 to 3 per cent and reducing the fertilizer value of the ash considerably. On the other hand, a low potash content was accompanied by a low chlorin content, and such samples are regarded as having a good fertilizer value. A high potash content and a low chlorin content were very seldom found in the same sample. In 60 per cent of the samples analyzed the relation of potash to chlorin was as 10 to 20, and in 80 per cent as 10 to 25. It is recommended that for the preparation of the ash the tobacco plants be burned at a high temperature and that wood with a low chlorin content be used for fuel.

HORTICULTURE.

Novelties in vegetable fruits, B. D. Halsted (*New Jersey Stas. Bul. 209, pp. 24, pls. 4, figs. 10*).—As in previous years the stations offer several vegetable novelties originated in connection with plant-breeding investigations. The list includes white and yellow strains of Golden Bantam crossed with Premier, Stowell Evergreen, Banana, and Adams-Crosby sweet corns, 5 new tomato crosses, the Ivory and Jersey Pink eggplants, a snap bean with wax pod, and a snap bean with green pod, the Jersey Green and the Fluted Orange summer squashes.

Horticultural descriptions with illustrations are given of the various crosses, together with extracts from reports on some sweet corn crosses which were sent out in the previous year (E. S. R., 18, p. 836).

Vegetable growing, H. L. W. Costenoble (*Govt. Isl. Guam, Dept. Agr. Bul. 1, pp. 14*).—This bulletin contains brief cultural directions for the cultivation of all the more common vegetable crops.

The bean industry of Ontario, G. G. White (*Rpt. Farmers' Insts. Ontario, 1906, pt. 1, pp. 83–102, map 1*).—An account of the origin and development of the bean industry in the different sections of Ontario, including considerable data relative to the soil formation in the different districts, together with directions for bean culture in which soil and soil preparation, cultivation, harvesting, insects and diseases and their control, varieties, and marketing are discussed.

Sweet corn investigations, M. N. Straughn (*Maryland Sta. Bul. 120, pp. 37–78, fig. 1*).—In a previous station bulletin (E. S. R., 16, p. 665) the experience of several local sweet corn growers in saving and growing their own seed was cited to show that as good seed can be grown in Maryland as in the New England States, where most of the sweet corn seed is secured. Considerable information was also given relative to the practical methods of producing sweet corn for seed.

The present bulletin contains a report of a supplementary study along these lines, as well as for the purpose of securing preliminary data for the systematic breeding of sweet corn. The work reported includes several analytical studies relative to the methods of determining sugar in sweet corn; the relative sugar content in dried and green corn as well as its relation to physical characteristics; comparative analyses of dried, green, and canned corn, composition of corn grown in different latitudes, effect of storage at different temperatures, and a study of the enzyms of green and dried corn. The results of breeding work to date, together with observations on the proportion of husk, grain, and cob, and the relation of varieties to insect ravages are also reported.

Although it was impossible when the work was started to obtain seed from the same variety grown at many different places or at a sufficient range of latitudes and altitudes to procure full data, some 41 samples of seed were procured representing 29 varieties and grown in at least 7 different States. These samples were analyzed and the tabulated results show a considerable range in the sugar content of the different varieties, although there appears to be no difference in favor of any particular latitude.

By removing a few rows of kernels analyses were made of several samples of green corn and, later, of dried corn of the same ears. The varieties used were Crosby and Stowell Evergreen. An examination of results shows no correlation between the sugars of corn in the green and dried state, hence, it is concluded that in selecting corn for breeding the selection should be made when the corn is in the green edible or canning stage of ripeness.

It is claimed by seedsmen that ears the kernels of which are of a deep amber color and more or less transparent are much sweeter than those in which the kernels are opaque and white, and kernels having a fine wrinkle are also supposed to be sweeter than those with a coarse wrinkle. A test of these methods of selecting seed showed practically the same sugar content in kernels of different color, but there appeared to be a relation between the wrinkle of the kernel and the percentage of sugar. "The lowest percentage of sugar in the fine wrinkled kernels is above the average percentage in the coarse wrinkled and the highest percentage of sugars in the individual ears having a coarse wrinkle is much less than the average in the fine wrinkled ones."

The seed for the breeding work was secured from Connecticut and planted both at the station and in two other sections of the State. One ear was used to a row and a sample was taken from each ear and analyzed as to its content of sugar, protein, and fat. After harvesting typical ears were taken from each row and again analyzed. The tabulated results show the average sugar content of the progeny to be higher than in the parent, while with the protein and in most cases with the fat content the reverse is true. The parent ears whose sugar content was the highest produced progeny with a higher percentage of sugar than any of the other ears and higher than the highest of their parent. From these results it appeared that the corn was not only improved by being grown in Maryland, but that some ears have a greater ability to transmit qualities than others.

Considerable tabular data are given showing the effect, as indicated by the composition, of breeding by the ear to row method. Three plats were selected from the first year's planting and analyses made of a number of ears from each row. These ears were allowed to ripen and were planted in the season of 1907. The result again indicated the tendency of certain individual ears to transmit a high percentage of sugar and that this tendency prevails throughout the entire row grown from such an ear. The Crosby variety was found to be much sweeter than the Stowell Evergreen.

A test was made in 1906 as to the relative percentage of sugar in the upper and lower ears from the same stalk. The results show that there is no advantage to be gained in selecting the upper or the lower ear, providing both are of equal development, maturity, and vitality.

In a test made relative to the effect of storage at various temperatures on the sugar content, 3 lots of corn were used, about 50 ears in all, at the same stage of ripeness. The sugars were determined in some and the remainder stored, one-half at room temperature and the other half in the refrigerator. The corn was stored both in the husk and husked, and a third portion was husked and wrapped in oiled paper. Ears were taken from each lot at the end of 24, 48, 72, 96, 112, and 120 hour periods, and the moisture and total sugars determined. Upon standing 24 hours about one-third of the sugars disappeared and within certain limits the loss continued during storage. Deterioration in taste was also noted as length of storage increases. The results show no material advantage either in husking the ear, wrapping it in oiled paper, or storing it in the refrigerator. It would appear that the ferments work at a very low temperature, and that the original qualities of corn would be hard to preserve, hence, the corn should not be pulled until ready for use, and should be marketed and canned with as little delay as possible.

Data are given showing the observations made as to the proportions of husk, grain, and cob in a large number of samples. The Maryland grown corn ranged from 24.88 to 47.36 per cent kernels. In cooperation with the Bureau of Chemistry of this Department experiments were conducted to show the influence of environment upon the composition of sweet corn. Two varieties, Crosby and Stowell Evergreen, were grown in South Carolina, Maryland, New Jersey, Connecticut, and Maine. From 20 to 100 analyses were made of each variety at each station when the corn was in prime eating or canning condition. South Carolina produced corn with the highest sugar content, while Maryland was second. New Jersey gave the lowest percentage, although this is believed to be caused by a severe drought occurring just previous to the tasseling of the corn. The results indicate that sweet corn may follow the habits of sugar cane rather than those of sugar beets.

A study was made, by methods which are described, to determine whether any organized ferments were causing the disturbance which prevented the application of the usual methods of determining sugars. "These results show that enzyms were present and very active. All of the sugar can be gotten in solution by using water as a solvent, or water and alcohol; but in both cases the sugars increased, varying as the length of treatment varies. The alcohol reduces the enzymic action very perceptibly, but does not prevent it. By adding the alcohol and water boiling, and boiling for an hour, solution of the sugars is complete and action of enzyms is prevented.

Data are given relative to a method proposed by Girard of extracting sugar at a very low temperature in order to avoid the action of the enzyms; the action of enzyms on potato starch; and an analytical study of kernels of corn relative to the location of sugars and enzyms.

In 1905 Stowell Evergreen and Crosby sweet corn were planted on adjoining plats. With the Crosby over 50 per cent of the young plants were destroyed by wireworms, but only 2 per cent of the Stowell. As other conditions were equal, the failure of the worms to destroy the Stowell variety was attributed to varietal resistance.

Lettuce culture, C. F. AUSTIN and E. W. HALSTEAD (*Estac. Cent. Agron. Cuba Bul. 8, pp. 31, pls. 3*).—This bulletin contains brief popular directions on lettuce culture from seed sowing to harvesting, and concludes with a description (together with synonyms, confusing terms, and historical notes) of all the important types and varieties of lettuce as found in the work on American Varieties of Lettuce by W. W. Tracy, Jr. (E. S. R., 16, p. 871).

A Spanish edition of the bulletin is also issued.

Fruit culture in the Dutch East Indies, J. H. HEIJL and C. KWAST (*Bul. Kolon. Mus. Haarlem, 1907, No. 21, pp. 209, figs. 20*).—This bulletin consists of two prize essays by the above authors, respectively, on the subject of fruit culture in the Dutch East Indies. Both essays include a general botanical account of the various plant organs, chapters with regard to general methods of propagating, planting, etc., and specific notes on the culture of the more important varieties peculiar to that country.

Fruits of Ontario, 1906 (*Toronto, 1907, pp. 275, figs. 838*).—This book deals with the various orchard and small fruits in Ontario, including their geographical distribution, cultural directions, and varieties recommended for planting, with descriptions and illustrations.

The descriptions and illustrations of the fruits are by L. Woolverton and were prepared, with few exceptions, directly from the fruits themselves as grown in the province. The illustrations are confined to those varieties recommended on one or other of the lists of fruits for planting in Ontario (E. S. R., 17, p. 972). The notes on tree, bush, and vine were largely made from records taken by the same writer during the past 10 years in experimental work.

Other publications of the Ontario agricultural department were also used in preparing the work. The text concludes with various spraying formulas and a spraying calendar.

An experiment on the preservation of cider apples with formalin, G. Warcollier (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 7, pp. 581-584*).—In the present experiment the author attempted to verify the results secured at the Jodrell laboratory at Kew (E. S. R., 18, p. 1130).

Five varieties of cider apples were included in the experiment, from each of which 112 apples apparently free from disease were selected. Fifty-six fruits of each variety were so placed on the wooden floor of a storage room as not to touch in order that disease might not be spread by contact. The remaining 56 fruits of each variety were immersed for a period of 10 minutes in a 4 per cent solution of formalin, then allowed to drain, and stored in the same way as the untreated apples on a floor which had been previously washed with a 1 per cent solution of formalin. An examination was made of the treated and untreated fruits at the end of 2 months' time and the results are presented in tabular form.

Contrary to the results at Kew no favorable action was noted from the use of formalin. According to the author, generally speaking the untreated apples appeared to be better preserved than the treated apples. Both the treated apples and the floor upon which they were placed are said to have been perfectly dry the second day after treatment. Both groups of apples appeared healthy at the end of the first month. The author is of the opinion that the real value of this method will not be fully established until it has been submitted to commercial experiments on a large scale.

Japanese persimmons, F. H. Burnette (*Louisiana Stas. Bul. 99, pp. 23, figs. 14*).—A number of varieties of Japanese persimmons have been grown at the station for the past 18 years, most of which have fruited. This bulletin contains brief suggestions as to the methods of propagating and growing persimmons, together with horticultural descriptions and illustrations of varieties which have been fruited at the station, and notes on the fruit and its treatment, enemies and diseases, marketing, and uses.

It is concluded that Japanese persimmons may be grown with the greatest success throughout Louisiana. They are easily grown and marketed, stand transportation well, and command a ready market. It is believed that an economical method will soon be evolved for the treatment of astringent varieties. A number of the varieties are not astringent and may be eaten while still hard.

The best wine grapes for California. Pruning young vines. Pruning the Sultanina, F. T. Bioletti (*California Sta. Bul. 193, pp. 141-160, figs. 11*).—In the first part of this bulletin the author discusses the importance of selecting varieties suited to each cultural region as well as to the kind of wine which it is desired to produce. Lists are given of varieties for planting for the production of sweet and dry wine in the interior valleys, and for the production of dry wine in the different sections of the coast country.

The second portion of the bulletin is devoted to practical suggestions regarding the pruning and training of grapevines during the first three years of their growth. Illustrations are given showing the systems of pruning and training advised.

Relative to the Sultanina (Thompson Seedless) grape, there appears to be a general variation in the crop of different years and from the different vines in the same vineyard and in adjacent vineyards in the same district. The cause of this variation is believed to be defective pruning. The Sultanina bears well only on long canes, and the crop is usually good as long as the canes which are tied up consist of bearing wood. Failure to provide for a growth of new canes from the stump, in order to furnish bearing wood for the following years, results in bringing the bearing wood to the top of the stake where it can not be properly tied and is usually pruned short.

Two methods are suggested and illustrated for the promotion of an annual growth of fruit wood in a position where it can be utilized. The first consists in bending the fruit canes into a circle, thus diminishing the tendency of the sap to go to the end of the fruit canes and favoring the development on the lower parts of the canes of shoots which may be used for fruit canes during the following season. The second method consists in the use of a wire trellis instead of the single stake system, the fruit canes being placed in a horizontal position and tied to the wire. The horizontal position has the same effect as curving the vine in promoting shoot growth on the fruit canes, and at the same time encourages the development of buds on the wood spurs.

The influence of pinching fruit-bearing shoots of the vine on the sugar content of the grape, G. RIVIÈRE (*Jour. Soc. Nat. Hort. France, 4. ser., 8 (1907), July, pp. 423-425*).—A brief account is given of experiments conducted by the author in conjunction with Bailhache and Hamel-Pigache relative to the influence of pinching on grapevines, in which the fruiting shoots were pinched back before the flowering season (May 15) to no leaves, and to 1, 2, 3, and 4 leaves, respectively, beyond the second bunch of grapes. The variety studied was Chasselas Doré. All sprouts were removed, the berries were thinned in the bunch, the fruiting shoots being ringed soon after the flowering season, and each vine bore the same number of bunches. On October 10 the matured grapes on the variously treated shoots were analyzed.

The tabulated data given show the pinching to have exerted a greater or lesser influence on the chemical composition of the must, according to the number of leaves left. The sugar content per liter of must decreased approximately in proportion to whether 4, 3, 2, 1, or no leaves were left on the shoot beyond the bunches. Where 4 leaves were left the sugar content was 145.8 gm., while where no leaves were left it was only 70 gm. On the other hand, the acid content increased from 36.3 gm. where 4 leaves were left beyond the bunches to 60.5 gm. where no leaves were left.

With the variety studied, at least, it seems advisable where pinching is employed to leave at least 4 leaves beyond the last bunch of grapes. The work is to be continued in order to determine whether the sugar content is further enhanced when more than 4 leaves are left.

Report on the tea industries of Java, Formosa, and Japan, A. C. KINGSFORD and M. K. BAMBER (*Colombo, 1907, pp. 31, pls. 83, figs. 3, maps 2*).—In this report considerable information is given with regard to soils and climatic conditions, varieties, and the important operations in the culture and manufacture of tea in the above-named countries. The data were collected during a personal visit of the authors to these countries in 1904, and the text is accompanied with maps and numerous illustrations, which form an important feature of the report.

Theobroma cacao or cocoa: Its botany, cultivation, chemistry, and diseases, H. WRIGHT (*Colombo, 1907, pp. XII+249, pls. 18*).—In this book the author combines the results obtained in experimental work with cacao at the Peradeniya experiment station with those obtained by different investigators in various cacao-growing countries. Among the subjects considered are historical notes, climatic conditions, botanical characteristics of cacao plants, varieties and seed selection, the periodicities of parts of the cacao tree, cultivation alone and with other plants, plantation management, harvesting, fermenting, washing, curing and polishing of cacao, physical and chemical character of soils, the chemistry of the tree, fertilizers, yields and diseases, as well as the exports, imports, and uses of cacao.

Cacao cultivation, O. W. BARRETT (*Proc. Agr. Soc. [Trinidad], 7 [1907], pp. 131-158*).—A special report on this subject delivered before the committee of the agricultural society of Trinidad in September, 1907, in which the author offers numerous suggestions with regard to the proper pruning of trees in the nursery, at planting time, and subsequently, with special reference to the protection of the tree from attacks of canker. Suggestions are given with regard to the use of cover crops and fertilizers.

The art and craft of garden making, T. H. MAWSON (*London, 1907, pp. XX+310, pls. 3, figs. 260*).—In this work the author deals with the various phases of garden designing. Consideration is given to the selection of the site and its treatment, fences and gates for gardens and parks, entrance gateways, carriage courts and drives, terrace and flower gardens, lawns, walks, summer houses, trellis work, garden furniture, the treatment of water fountains, lakes, streams and ponds, conservatories, greenhouses, vineries, fruit houses, kitchen gardens, orchards, avenues, hedges, planting for landscape effect, trees, shrubs, conifers, hardy climbers, roses, hardy perennials, aquatic plants, and ferns. Lists are given of the best varieties for the various forms of planting, and the text is accompanied with photographs, sections, sketches, and detailed plans illustrative of various styles of garden designs.

The book of rock and water gardens, C. THONGER (*London and New York, [1907], pp. X+94, pls. 26*).—This is volume 28 of a series of handbooks for practical gardening edited by H. Roberts and deals with the construction and development of rock, Alpine, water, bog, and marsh gardens, with lists and descriptions of plants recommended for the different forms of planting. The text is accompanied by numerous illustrations.

The production of Easter lily bulbs in the United States, G. W. OLIVER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 120, pp. 24, pls. 4, figs. 3*).—Although Bermuda is at present the main source of supply of Easter lily bulbs for the United States, in many cases the plants grown from Bermuda bulbs in this country are so greatly diseased as to be practically unsalable. Previous experiments undertaken to develop the bulb industry in this country appear to demonstrate the impossibility of producing bulbs asexually as is practiced in the Bermudas and Japan.

For several years the Bureau of Plant Industry has endeavored to establish the bulb industry in this country through propagation by seedlings, since in previous work of the Bureau (E. S. R., 15, p. 259) it was discovered that seedling plants were practically free from the disease. A large number of seedlings were grown and distributed on the Pacific coast and Florida. The present bulletin summarizes the results of this work to date. Conclusions based on these trials are given as to localities adapted for lily bulb growing, varieties, advantages of seedlings over plants produced asexually, selection of seed bearers and seedling types for propagation, together with cultural directions, including preparation of the soil and planting operations, pollination, seed sowing and transplanting. Comparative data are also given on ranges of temperature and precipitation at Prospect and Hamilton, Bermuda, as compared with lily-growing regions of the United States.

The experimental work now being conducted on the Pacific coast promises successful results. In addition to the elimination of disease, the seedling method is found to be quicker than propagation by scales or from small bulbs. Under favorable conditions plants can be depended upon to give bulbs of salable size the first year. The usual sizes secured are from 5 to 7 in., but a considerable percentage of 7 to 9 in. bulbs is found where good attention has been given. The crop is ready for harvesting early in August. The smaller bulbs, when replanted soon after being harvested, grow much better than the imported material.

In the tests conducted in California during the past 3 seasons the best success was obtained with seedlings from crosses of the red-stemmed *Lilium longiflorum giganteum* with *L. longiflorum harrisii*. These seedlings are composed of four distinct types, long-leafed and short-leafed green-stemmed plants and long-leafed and short-leafed red-stemmed plants. All show a remarkable freedom of bloom and in some localities are totally free from disease. The text is accompanied with plates and figures illustrative of the work being conducted in California.

The rose and the essence of roses (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], (*1907*), *No. 9, pp. 1071, 1072*).—A brief report by the French consul at Philippopoli on rose culture and the manufacture of the essence of roses in eastern Roumelia.

FORESTRY.

British trees, R. V. Cole (*London, 1907, vols. 1, pp. 360, pls. 103, figs. 120; 2, pp. 361 + VII, pls. 76, figs. 131*).—In this work the author traces the life histories of all the important British trees. In all 430 reproductions of original drawings and paintings by the author accompany the text, consisting of drawings of one whole tree in each species and of the parts of the tree separately in the various stages of growth.

The work is intended as a book of reference for artists, designers, and landscape students, as well as to furnish to the lover of trees more accurate knowledge of their growth and character.

Our trees and how to know them, C. Kirk (*London, 1907, pp. 68, figs. 60*).—This book is made up of 60 photographs of the more common forest trees of Great Britain, showing the branch and in most cases the fruit. The common and botanical names are given, together with some short notes by A. L. Gowans, designed to assist the reader in identifying the trees.

Big trees of California, G. Clark ([*Redondo, Cal.*], *1907, pp. 104, pls. 20*).—A popular illustrated account of the big sequoias of California, including their origin and distribution, size, age, habits and characteristics, cones and seeds, and reproduction, together with descriptions of the Sequoia National parks and celebrated specimens. The text concludes with the botanical nomenclature of the sequoia.

Forest tables for western yellow pine, E. A. Ziegler (*U. S. Dept. Agr., Forest Serv. Circ. 127, pp. 23*).—A total of 22 stand, height, growth, volume, and form tables are given for western yellow pine, including *Pinus ponderosa* proper, the variety *scopulorum*, and *P. jeffreyi*. These species are classed together, since the distinction is too slight to affect materially the form and growth tables. The data used in compiling these tables were collected by field parties in connection with various projects in several of the National Forests in the West, and although not gathered according to a set plan are considered sufficient for the immediate requirements of exploitation and forest management. The widely varying factors of temperature and rainfall in different parts of the western yellow pine region show a corresponding variation in the tree development.

Based upon the difference in growth and form three regions are recognized: (1) the isolated Black Hills region; (2) Arizona, New Mexico, southern Colorado, and the lower and drier mountains of southern California; and (3) northern California, Oregon, Washington, and the moister parts of Montana. In the first two regions the rainfall is slight, the tree growth is slow, and the stems short and full, and open stands are formed. In the third region the rainfall is much heavier and the tree growth more rapid with more slender stems, and rather dense stands occur. These characteristics appear most conspicuous in volume tables, but are traceable in the stand, height, and diameter growth tables as well.

Treatment of hardwood lands in southwestern Connecticut, R. C. Hawley (*Forestry Quart., 5 (1907), No. 3, pp. 283-295*).—The methods of treatment which appear best adapted to the hardwood stands typical of southwestern Connecticut are outlined in a preliminary way. Consideration is given to the constitution of the hardwood stands in the region and to the details of treatment of stands first taken under management when 30 or more years of age, and of stands under forest management from early youth.

Practical forestry on a spruce tract in Maine, A. Cary (*U. S. Dept. Agr., Forest Serv. Circ. 131, pp. 15*). In this circular an account is given of the 6 years' experience of the author as forester in the employ of a large lumber and paper company of New England, during which time an attempt was made to apply practical forestry to the timber tract of the company. A description is given of the tract as well as the conditions at the start, together with a detailed account of the various improvements introduced and the methods of applying them.

The improvements effected are given as (1) increased economy in utilizing the stock of timber standing on the land, (2) a system of cutting adapted to the land, the timber, and the business organization, as well as to the promotion of future growth, (3) the checking of a big insect depredation, and (4) the development of a map system devised and in a large measure carried out to handle a large land property with more economy and effectiveness than could otherwise be done.

Afforestation at Inverliever, J. Nisbet (*Country Life [London], 22 (1907), No. 565, pp. 627, 628, figs. 3*).—A brief illustrated description of the Inverliever estate in Argyllshire, Scotland, recently purchased by the government to be used for forestry purposes. The estate has an acreage of about 12,530 acres, consisting chiefly of rough hill pasture and moorland which, it is believed, will be suitable for planting and growing timber crops profitably.

Results of the application of commercial fertilizers in the Aazof forest, I. Gutorovich (*Abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 1, p. 71*). This is an abstract of the author's report on commercial fertilizers, made to the Baltic government forest officials in 1905.

Tests of fertilizers on the development of 1-year old trees on sandy soil of dune origin indicated that nitrate of soda exercised the most favorable influence. Thomas slag and kainit also increased the growth, while gypsum appeared to retard it.

The drain upon the forests, R. S. Kellogg (*U. S. Dept. Agr., Forest Serv. Circ. 129, pp. 16, figs. 8*).—In this circular summarized data and charts are given, showing the extent to which forests were exhausted both by species and in the different States in 1906 in the production of lumber, shingles, hewed cross-ties, pulp wood, cooperage stock, round mine timbers, lath, wood distillation, veneer, poles, tanning materials, turpentine and rosin, and unknown drains. Comparative data are also given showing the lumber production of the United States in 1880, 1890, 1900, and 1906, and the relative production in 9 States in 1880 and 1906. The charts and data are for the most part based upon the statistics of the various forest products for 1906 compiled by the Bureau of the Census in conjunction with the Forest Service, and which are being issued in the form of a circular for each product.

Consideration is briefly given to the present forest area, volume, and annual growth, and some approximate estimates are made as to the length of time our timber supply will last at the present rate of cutting. The total annual use of wood is estimated by different authorities from 100 billion to 150 billion ft., and the total forest area of the United States from 500 million to 700 million acres. The annual consumption of wood is estimated at probably three times the annual growth.

Production of veneer in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 133, pp. 6*).—This circular contains statistical data collected and compiled by the Bureau of the Census in conjunction with the Forest Service, and shows the production of veneer by 315 mills during 1906. A total of 329,186,000 bd. ft., log scale, of timber was converted into approximately 2,068,094,000 sq. ft. of veneer.

Tabulated data are given showing the quantity and value of material used and the quantity of veneer produced in 1906 by States and by species. The highest average value per thousand feet of wood used was $67.76 for walnut. White oak ranked second, valued at $31.67 per thousand feet, and red oak third, valued at $26.61. The largest amount of veneer was cut from red gum, followed by yellow pine, white oak, maple, cottonwood, yellow poplar, and a large number of other species.

The Powell method of conserving wood with sugar (*Baumaterialienkunde, 12* (*1907*), *No. 17, pp. 268–270*).—A description is given of the methods employed by the Powell Wood-Process Syndicate in preserving wood with a common sugar solution. In this process no mechanical pressure of any kind is used, the wood being placed in a vessel of cold water to which is added a sugar solution of a certain strength. The mixture is then gradually heated to the boiling point of the sugar solution, at which temperature it is maintained for a considerable length of time, depending upon the size and nature of the wood being treated, as well as to a large extent upon the judgment of the operator.

After sufficient time has elapsed to drive the air and moisture out of the wood, the solution is allowed to cool gradually. During this cooling process the wood becomes saturated with the sugar solution, which is said to unite so thoroughly with the wood fiber that subsequent inspection of a section of the wood with a microscope fails to detect sugar either in the form of crystals or drops.

Among the advantages offered for this process, which is said to be effective in preventing dry rot, are the simplicity and small cost as well as the rapidity with which the impregnation can be conducted. Moreover, the treatment of green or freshly felled woods by this method is said to have proved very satisfactory. With woods that have been air-dried before treatment and are more or less checked or cracked the sugar solution acts as a cement. It is also said to act as a filler in the case of the more costly woods, such as mahogany, without injuring the surface in anyway, and to render inferior grades of such woods practically as satisfactory as the better qualities.

In cooking woods in the sugar solution the coloring matter of the wood is said to color the solution without, however, making the treated wood any lighter in color by the process. On the contrary, it is stated that woods treated in this manner assume a darker color as in the case of wood which is submitted for a long time to the action of the air. In the preservation of light colored and white woods, however, a fresh solution is used at each operation, the colored solution afterwards being used for preserving wood in which the color plays no important part.

Paving blocks thus treated were experimented with in London upon the streets and are said to have proved satisfactory. The wood remains indifferent to heat and moisture, and is said to form a homogeneous and smooth surface. Since sugar is odorless and since paving blocks treated in this manner do not sweat and can be easily kept clean, their use is believed to be desirable from the hygienic standpoint.

The seasoning and preservative treatment of hemlock and tamarack cross-ties, W. F. Sherfesee (*U. S. Dept. Agr., Forest Serv. Circ. 132, pp. 31, figs. 4*).—Owing to the increasing scarcity of white oak, hemlock and tamarack are now being considerably used as tie timber. In 1905, 3,060,082 tamarack and 1,713,090 hemlock ties were purchased by the railroads of the United States. Ties made from these species last only about 5 years when untreated, hence they are usually treated with some preservative, of which zinc-chlorid is most commonly employed.

In this circular an account is given of a cooperative experiment undertaken in the spring of 1905 by the Forest Service and the Chicago and Northwestern Railway Company, in order to determine the results obtained at the railway company's treating plant and to devise methods for bettering the treatment. Considerable data are given and discussed relative to the methods and results of seasoning and treating, together with the conclusion reached and recommendations based upon the results of the experiments. The cost of impregnation with zinc-chlorid was found to be 12 cts. per tie. It is estimated that an added life of a single year makes the cost of treatment practicable, and an added life of 5 years secures a saving of 36.3 per cent of the annual charge. Although the absorption of hemlock and tamarack is difficult as compared with porous species, the treatment of these timbers results in a decided economy to both the railroads and the forest resources of the country.

During the experiment some 6,000 ties have accumulated, which were cut in different months of the year, seasoned in different ways, and treated under varying conditions. These ties are to be placed in a trial section of track with a view of putting different methods of handling, treating, and protecting ties to a practical test. The proposed method of procedure is described.

Preservation of piling against marine wood borers, C. S. Smith (*U. S. Dept. Agr., Forest Serv. Circ. 128, pp. 15, figs. 5*).—This circular contains the results of a study of the character and extent of damage done by marine wood borers and of the present methods of protecting piles, and which was made with the view of devising an efficient and cheap method of protection. The kinds of wood used for piles in different regions of this country are enumerated, the marine wood borers are discussed relative to their structure and habits, and an account is given of the methods used for protecting movable structures and piling and of their efficiency.

The conclusion is reached that the use of properly creosoted material for piling should be extended. The denser timbers are unsuitable for the purpose, since it is difficult to secure a satisfactory penetration of the oil, but timbers of open grain like loblolly pine are easily penetrated and embody all of the characteristics of an ideal pile timber. The extension of their use is recommended, since a uniform and satisfactory penetration can be secured with such timbers when properly air-seasoned before treatment, and by the elimination of the expensive "pressure-cylinder" process, 50 per cent or more of the time required for treatment is saved, and there is also a considerable reduction in cost.

As a result of many experiments conducted by the Forest Service to devise a cheap and efficient method for the preservative treatment of timber the open-tank method, which has been previously described (E. S. R., 19, p. 150), was evolved. The application of this method to the treatment of piling is briefly discussed, and a diagram is given of an open-tank treating plant adapted for piling.

Rubber in New Caledonia, ETESSE (*Agr. Prat. Pays Chauds, 7 (1907), No. 53, pp. 101-120, figs. 5*).—An account of the development of the rubber industry in New Caledonia, including historical notes, statistics of exports from 1898 to 1907, and the text of laws enacted by the Chamber of Agriculture with regard to planting and methods of exploiting rubber, together with the botanical characteristics of the different varieties of *Ficus prolixa* or Schlechteri, which is said to be the only successful rubber-producing species in that country.

The author describes the common methods of harvesting and preparing rubber in that region and the work of reafforestation, and emphasizes the importance of continuing this work in the development of the colony's resources.

The Federated Malay States rubber industry, J. B. CARRUTHERS (*Abs. in Trop. Agr. and Mag. Ceylon Agr. Soc., 29 (1907), No. 2, Sup., pp. 31-33*).—A report on rubber planting operations in the Federated Malay States for 1906. At the close of that year the total acreage planted to rubber in the Malay Peninsula was 99,230 acres, of which 85,579 acres were in the Federated Malay States, or an increase of over 45,000 acres since the end of 1905. The total number of trees planted in the Federated Malay States up to December 31, 1906, was 10,745,002 as compared with between 6,000,000 and 7,000,000 at the end of 1905. The output of rubber in 1906 was 385 tons, or about 3 times as much as the previous year. The average amount of dry rubber extracted per tree is calculated at 1 lb. 12 oz., although the trees over 10 years of age are said to yield more than 2 lbs. per tree.

In connection with the present report notes are also given with regard to the future of plantation rubber and the importance of combating diseases and insects on rubber estates, as well as the question of labor and the opening of new rubber lands in the Federated Malay States.

Tapping experiment with Kickxia elastica, A. ZIMMERMANN (*Pflanzer, 3 (1907), No. 12-14, pp. 182-187*).—The author describes a new method of tapping this species of rubber tree, with which he is experimenting in German East Africa. The trees are tapped through a series of small horizontal knife cuts, the cut being made at such an angle that the flowing latex from a series of cuts is made to run down the bark of the tree in a single path, this path being determined by first painting the bark with moist latex. The latex has a tendency when flowing to keep to the strip which is painted, and when conducted below the different series of cuts it flows through a zinc gutter fastened in the tree into a receptacle at the base.

This method is said to be adapted for *K. elastica* since the latex is relatively thin and the bark fairly smooth, so that the latex can be conducted down the tree without any difficulty. No large quantities of rubber have been secured thus far, as the trees are young, but from the present work the author is led to recommend the planting of this species in German East Africa in regions where the soil is somewhat fertile, periods of drought not too severe, and the altitudes around 500 meters above sea level.

DISEASES OF PLANTS.

Plant diseases and other injuries to cultivated plants, K. A. MALKOFF (*Ghod. Otchet Drzhav. Zeml. Opitna Stantz. Sadovo* [*Jahresber. Staatl. Landw. Vers. Stat. Sadovo*], *4 (1906), pp. 147-176*).—Notes are given on preventive treatment for stinking smut of wheat, cotton diseases, a disease of anise, and bacterial diseases of sesame, and miscellaneous observations on diseases and insects found attacking a large number of economic plants.

In the experiments for the prevention of smut, seed of durum wheat was treated with 0.1 per cent formalin, 0.1 per cent copper sulphate, antismut, hot ashes, and hot dry air, and washed with water. The resulting crops from the seed treated with formalin and with antismut were entirely free from disease. The proportion of smut where the seed was treated with copper sulphate was 0.23, while the hot air and hot ash treatments resulted in a greater amount of smut than that produced on the plats planted with untreated seed.

The cotton diseases described are a leaf spot due to *Phyllosticta malkoffii*, and the cotton wilt (*Neocosmospora vasinfecta*).

The anise disease is said to be caused by *Cercospora malkoffii* on the leaves, and spraying with 1 per cent Bordeaux mixture is advised.

The bacterial diseases of sesame have been under investigation for some time, and two forms are recognized, one due to *Pseudomonas sesami* and the other to *Bacillus sesami*. Treating the seed with formalin has successfully reduced the amount of disease.

A German résumé of the investigation is given.

The fungus diseases of garden crops and their prevention, A. Naumann (*Die Pilzkrankheiten gärtnerischer Kulturgewächse und ihre Bekämpfung. Dresden, 1907, pp. VIII+156, pls. 3, figs. 42*).—The first part of this work gives a general account of plant diseases caused by fungi, with directions for the study of fungi and keys for the identification of species, after which the more important groups of fungi are discussed at some length. Directions are given for the preparation of material for study, methods for conducting inoculation experiments with fungi, and a general discussion of fungicides and other means of combating diseases.

In the second part of the work descriptions are given of the diseases of vegetables, ornamentals, and greenhouse and hothouse plants, together with suggested means for their control.

Plant diseases, L. R. Jones (*Agr. of Mass., 54 (1906), pp. 21-48*).—This is a lecture before the Massachusetts State Board of Agriculture in which the author paid particular attention to the diseases of the apple and potato.

The results of spraying experiments with potatoes are given and attention called to the resistance of certain varieties to disease. In this respect some European varieties appear more resistant than American ones, but the quality and yields of European sorts are such that they can not be recommended for general planting. A discussion followed the presentation of the paper in which the relation of disease to moisture, fertilizers, etc., was commented upon.

The conidial form and pathological significance of Phellomyces sclerotiophorus, O. Appel and R. Laubert (*Arb. K. Biol. Anst. Land u. Forstw., 5 (1907), No. 7, pp. 435-441, pl. 1*).—From their investigations the authors were led to conclude that *P. sclerotiophorus* is a form of *Spondylocladium atrovirens*. While the fungus may possibly cause some injury, their investigations seem to show that it is not of very great importance.

Sclerotinia trifoliorum, the cause of clover canker, L. C. Coleman (*Arb. K. Biol. Anst. Land u. Forstw., 5 (1907), No. 7, pp. 469-488, figs. 14, dgm. 1*).—The author reports that clover canker was observed near Dahlem in clover that had been seeded on oat stubble, and that by midwinter many of the plants were destroyed. In February numerous sclerotia were observed on the roots of dead plants, and in the following October the apothecia of the fungus were abundant. Studies were made of the fungus in various culture media, and successful inoculation experiments were carried on by sowing the spores on the young leaflets.

Plat experiments showed that practically all races of red clover are subject to the canker and probably other clovers as well. Although the experiments are not considered entirely conclusive, alfalfa showed some indication of being injured by the presence of the fungus. The inoculation material was all taken from diseased red clover plants, and it is possible that the occurrence of the fungus on some of the clovers which has been reported by other observers may be due to the fact that there are different varieties or races of the fungus, and that the author's failure to get the fungus to grow on some of the host plants may be attributed to this fact.

The conclusions of the author state that young clover plants are readily affected by the spores of *S. trifoliorum*, but that older plants are attacked more rarely and only under favorable conditions. The spore infection does not take place through the stomata, but the mycelium always penetrates the epidermal cell walls. The fungus attacks the aerial parts of the plant, spreading from them to the roots, never through the soil nor from the roots to the aerial stems. The spores retain their vitality for months, even when dried. A strong application of lime to clover fields did not serve to prevent the growth of the fungus.

A contribution to the knowledge of the potato plant and its diseases, I, O. APPEL (*Arb. K. Biol. Anst. Land u. Forstw., 5 (1907), No. 7, pp. 377-435*).—A historical and critical review is given of the literature relating to the diseases of the potato. A bibliography of several hundred titles of articles which the author has consulted is appended. The summary is arranged according to periods, the first period being from 1571 to 1838, the second from 1840 to 1855, and the last from 1856 to date.

Stysanus stemonitis and its rôle as a potato parasite, O. APPEL and W. F. BRUCK (*Arb. K. Biol. Anst. Land u. Forstw., 5 (1907), No. 7, pp. 441-448, figs. 5*).—An account is given of the disease of potatoes attributed to *S. stemonitis*, which has been associated in this country with a disease characterized by the browning of the tubers in the region of the fibrovascular tissues (E. S. R., 14, p. 263). There appears to be no doubt but that the fungus while usually a saprophyte may also become an active parasite.

The ring disease or iron spotting of potatoes, A. MAYER (*Jour. Landw., 55 (1907), No. 4, pp. 301-304*).—This disease has been attributed to various causes, such as bacteria (E. S. R., 19, p. 518), soil conditions, lack of lime, etc., and the author has attempted to determine the question of its being due to a lack of lime.

Tubers grown in soils containing diminishing proportions of lime were affected in proportion to the deficiency of lime in the soil. An examination of the ash of diseased tubers showed that the lime content was much lower than in normal potatoes. The disease is said to always be worse when potatoes follow spurry or late turnips, although no connection could be found between those crops and the cause of the potato disease.

Tomato diseases, P. H. ROLFS (*Florida Sta. Bul. 91, pp. 13-34, pls. 3, fig. 1*).—Descriptions are given of the rust of tomatoes due to *Macrosporium solani*, a fungus blight caused by *Fusarium* sp., a sclerotium blight due to an unrecognized fungus, a bacterial blight caused by *Bacillus solanacearum*, dropping of the buds, leaf curl, damping off, hollow stem, root knot, and some common insect enemies.

For tomato rust spraying with Bordeaux mixture is recommended. Rotation of crops is suggested as a means for the control of the Fusarium disease, and for the sclerotium blight spraying the soil about the plants with ammoniacal copper carbonate is suggested.

The dropping of the buds is said to be due to unusually cool weather at the time when the fields are in blooming condition, too great stimulation of the plants by the use of ammonia fertilizers, or the puncture of minute insects.

The leaf curl is said to be due to a number of causes, the most important one in Florida being the presence of too much moisture in the soil. The remedy for this suggests itself, namely, the preparation of the fields so that there will not be a superabundance of moisture.

The damping off occurs generally in the seed bed and is accompanied by a superabundance of moisture. This can be avoided by ditching about the seed beds and the removal of some of the plants if they are growing too thickly

The hollow stem disease is said to be a result of too vigorous nitrogen feeding in the seed bed, the plants being extra forced.

The root knot described is caused by nematodes and is prevented by the rotation of crops. As the nematodes affect a number of other plants, these should be avoided in any system of rotation.

The insects described are the fruit worm (*Heliothis armiger*), cutworms, and the white mold due to *Phytoptus calacladophora*. This mite is said to attack the tomatoes to such an extent at times as to produce on the stems a white moldy appearance. Sulphur spray, dry sulphur, lime-sulphur spray, and dry sulphur and lime are excellent remedies for its control.

Diseases of tobacco in Dumbara, T. Petch (*Circs. and Agr. Jour. Roy. Bot. Gard. Ceylon, 4 (1907), No. 7, pp. 41–48*).—Brief descriptions are given of a number of diseases of tobacco, among them a root disease due to Fusarium; two leaf diseases, one of which is caused by a fungus that has been recently determined as *Cercospora nicôtianæ;* a disease called ash, which is said to be one of the worst diseases in Ceylon, and is due to the Oïdium stage of some mildew, and the mosaic disease.

Prevention of apple crown-gall and hairy-root, G. G. Hedgcock (*Nat. Nurseryman, 15 (1907), No. 7, pp. 192, 193*).—An account is given of the crown-gall and hairy-root, the forms occurring on the apple being particularly described. The author claims that crown-gall is of two forms, the hard crown-gall, which is not contagious, and a form called soft crown-gall, which is possibly contagious. The hairy-root is not contagious, but it exists in a number of forms, which are described.

For the prevention of the apple crown-gall and hairy-root the author advises improved nursery methods of propagation, which involve budding, the careful selection of root grafts, better wrapping of grafts, selection of scions, earlier planting, etc., and attention to improved conditions of soil.

The author states that his experiment on the removal of crown-gall from trees indicates that about one-half of the trees treated recovered from the disease. No experiment for the removal of hairy-root has been concluded.

Apple-tree mildew (*Jour. Bd. Agr. [London], 14 (1907), No. 6, pp. 358–360, fig. 1*).—A description is given of the apple-tree mildew caused by *Sphærotheca mali*, which has become troublesome in orchards in certain parts of England. The ascigerous form of the fungus is said to be very rare and occurs too locally to account for the universal distribution of the mildew in the spring. It is thought on this account that either the fungus retains its power of germination throughout the winter, or that there is some form of hibernating mycelium.

As a rule the fungus checks the growth of the branches and distorts the leaves, covering them with a dense white powder.

Infection of the leaves takes place only when they are quite young, and it is believed that by cutting out the infected rosettes of leaves and spraying the trees with a solution of potassium sulphid the disease could be held in check.

While there does not appear to be any definite proof that the fungus is associated with scale insects and green flies, yet it appears to be most abundant on trees infected by these pests.

Cherry leaf scorch, E. S. Salmon (*Jour. Bd. Agr. [London], 14 (1907), No. 6, pp. 334–344, pl. 1, figs. 2*).—A description is given of the disease known as cherry leaf scorch, due to *Gnomonia erythrostoma*, the occurrence of which in England has been previously noted (E. S. R., 14, p. 59). The effect of the fungus on the host plant is described at length, as well as cultural characteristics of the fungus, and it is stated that one of the conspicuous symptoms of the disease is the persistence of the foliage throughout the fall and winter. This is due to the fact that the fungus develops in the leaf and passes down the leaf stalk, and that as a consequence of the changes produced the normal processes of defoliation are interfered with.

It has been usually recommended that the diseased leaves should be collected and burned, but the author found by spraying experiments with Bordeaux mixture that the fungus could be successfully controlled by such treatment. There does not appear to be any evidence that the fungus gains entrance into the wood, but it passes the winter in the dead leaves remaining upon the trees. By the removal of these and the thorough use of Bordeaux mixture, the disease can be controlled to a considerable extent.

The cocoanut industry in Cuba, MARY T. HORNE (*Cuba Rev. and Bul., 5 (1907), No. 11, pp. 18-20, figs. 2*).—A popular review is given of the cocoanut industry in Cuba, and attention called to the serious losses due to the bacterial bud rot. This disease has been under investigation for some time, and although no absolutely conclusive results have been obtained, it is believed that bacteria are its cause. The author describes some experiments for the control of the disease, which consist in the destruction by fire of all dead or hopelessly affected trees and the disinfection by fire of those showing an attack in its early stages. The results thus far obtained are such that it is believed that the disease might be kept under control if these measures should be adopted over a considerable area.

Diseases of cocoanut trees, F. A. STOCKDALE (*Proc. Agr. Soc. Trinidad and Tobago, 7 [1907], pp. 9-51; Trinidad Bot. Dept., Bul. Misc. Inform., 1907, No. 56, pp. 261-287*).—Previously noted (E. S. R., 18, p. 1057).

A root rot in oranges, J. S. JEFFERSON (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 11, pp. 815, 816*).—The attention of the author was directed to the presence of root rot in oranges in orchards in Western Australia, and upon examination it was found that practically all of the infected orange roots were either touching or in immediate proximity to rotting roots of red gum trees. From the samples examined the author believes that the disease is caused by a fungus which first attacks the decaying red gum roots, passing from them to the orange roots.

In a number of instances trees were saved by digging about them, cutting away the diseased parts, and treating the roots with Bordeaux mixture.

A stem disease of tea, T. PETCH (*Circs. and Agr. Jour. Roy. Bot. Gard. Ceylon, 4, (1907), No. 4, pp. 21-30, fig. 1*).—In a previous account on the root disease of tea (E. S. R., 16, p. 67) it is stated that possibly not all the injury attributed to the fungus Rosellinia could be positively demonstrated as caused by that fungus.

The present circular describes a disease that has hitherto been confused with the Rosellinia and for which trenching about the trees would be futile. This disease attacks the stem of the plant, and the fungus lives almost entirely in the wood, the fructifications only appearing in the bark. The disease is said to be due to *Massaria theicola*, a technical description of which is given, and for its control the author recommends vigorous pruning and covering the wounds with wood tar or some other antiseptic treatment. In case of severe attacks, painting the stems of infected trees with Bordeaux mixture might possibly prevent further injury.

The wet rot of chesnut roots, J. DA CAMARA PESTANA (*Bul. Soc. Portugaise Sci. Nat., 1 (1907), No. 2, pp. 55-70, pls. 2; Bol. R. Assoc. Cent. Agr. Portuguesa, 9 (1907), No. 12, pp. 686-702, pls. 2*).—This disease of chestnut trees the author says has been known in Europe for fully half a century and has been attributed to various causes. After a review of some of the literature relating to the disease, the author gives an account of his observations on it.

The disease seems to attack wild and cultivated trees in almost every soil and under every system of cultivation. The diseased trees are late in developing their leaves, the leaves are abnormal in color, and the terminal twigs are often stunted. The fruit may fall prematurely or it may hang on the tree for a year. The whole tree after a time presents an abnormal appearance and sooner or later dies.

An examination of the tissues of the aerial parts of the tree failed to reveal any abnormal character, but the finer roots were found to be darkened and often black. The cortex was easily removed, the tissues were soft and they exuded a black liquid which gave off an odor of tannin. When examined under the microscope a zone of the root between the sound part and that showing the above described characters was found to be infested with bacteria and mycelial strands. The latter appear to be connected with the mycorrhiza which normally occur on chestnut roots, and the author believes that the disease is due to the bacteria and to the mycorrhiza fungus having become parasitic in habit through a lack of nitrification in the soil.

Investigations on timber dry rot, A. MÖLLER (*Hausschwammforschungen. Jena, 1907, pt. 1, pp. IV+154, pls. 5*).—This is an advisory report by the author and others to a commission of the German ministry appointed to investigate the causes of dry rot of timber, effect of the rot on health, means for preventing attacks of fungi, etc. In the different papers the literature of the subject is reviewed, the morphology, anatomy, physiology, and biology of the different fungi described, and suggestions given for preventing their attacks.

The bud rot of carnations, F. D. HEALD (*Nebraska Sta. Bul. 103, pp. 1-24, pls. 6; abs. in Science, n. ser., 27 (1908), No. 684, p. 211*).—During the past few years a troublesome and destructive disease of carnations has been under observation. The disease was first reported in 1905 from a greenhouse in Nebraska, and a study of the material showed that the bud rot produces effects which show externally, the character depending upon the extent and severity of the infection. The most striking external condition is the failure of the affected buds to expand into perfect flowers. All affected buds show on close examination that all or part of the flower parts included within the calyx are affected with a rot which causes a brown coloration and a softening of the tissues.

The immediate cause of this disease is said to be *Sporotrichum anthophilum*, and it is associated constantly with a species of mite, which is described elsewhere (see p. 860).

The first and perhaps the most important factor influencing the development of this disease is the water relation, the bud rot being most prevalent where the air and soil have been kept too damp. Different varieties seem unequally subject to the attack of this fungus, the variety Lawson suffering more than any other, so far as the author's observations have gone.

For preventing this disease the measures recommended are clean culture, the reduction of the moisture to a minimum necessary for the healthy growth of the plants, and the picking of all infected buds as soon as they appear. These should be burned and under no conditions allowed to remain about the benches.

Leaf-spot diseases of ivy, H. Diedicke (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *19* (*1907*), *No. 4-6, pp. 168-175, pl. 1*).—Descriptions are given of the diseases to which the cultivated ivy is subject, among them those due to *Phyllosticta hedericola*, *P. hederacea*, *Vermicularia trichella*, and *Phoma* sp. The relations of some of these fungi, as indicated by inoculation experiments, are discussed.

Notes on the mildew and rust of roses, Noffray (*Bul. Soc. Nat. Agr. France*, *67* (*1907*), *No. 8, pp. 763-772*).—A discussion is given of the mildew of roses caused by *Sphærotheca pannosa* and rose rust (*Phragmidium subcorticium*). These two diseases are said to be among the most troublesome to which the rose is subject. For combating the mildew the author recommends pruning, sulphuring, and spraying with lysol. For the rust he suggests attention to the plants at the time when the æcidial stage of the rust is present, collecting and destroying all diseased material, and spraying when necessary. The mildew is said to be present on the roses throughout the growing season, but to be most troublesome in the spring and fall of the year.

Cryptosporium minimum n. sp. and frost injury of roses, R. Laubert (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *19* (*1907*), *No. 4-6, pp. 163-168, figs. 3*).—A disease of roses, caused by *C. minimum* n. sp., is described and figured. This fungus is reported as attacking the stems of certain roses, causing discolored canker-like spots 1 to 2 cm. in diameter. The author thinks the attack is associated in some way with frost injury to the host plant, the fungus being only partially parasitic.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A review of investigations in general biology, edited by Y. Delage (*Ann. Biol.* [*Paris*], *9* (*1904*), *pp XXX+514, figs. 3*).—A review is given of the most important literature published during 1904 relating to the structure and physiology of the cell, parthenogenesis, ontogenesis, regeneration, transplantation, general morphology, physiology, heredity, variation, origin of species, geographical distribution, and biological theories.

Proceedings of the Fourth International Ornithological Congress, edited by R. B. Sharpe (*London, 1907, pp. 696, pls. 18, figs. 5*).—The Fourth International Ornithological Congress was held in London, June 12-21, 1905. The proceedings of this congress have been edited and appear in the present volume. The subject-matter relates to all lines of ornithology including the collection of birds for museums, the migration of birds, the aims of modern ornithology, ornithological nomenclature, nesting habits of various birds, molting of birds, bird protection, the feeding habits of birds, aviculture, descriptions of species, and special discussions of limited groups of birds.

J. L. Bonhote presents the results of experiments in hybridizing ducks (pp. 235-264). In these experiments 5 species and 2 genera of ducks were used and nearly all crosses were perfectly fertile. The author proposes the terms trigen, tetragen, pentagen, etc., for hybrids resulting from crossing 3, 4, or 5 species of birds.

The Rationale of Bird Protection is discussed by F. E. Lemon (pp. 613-620). The diminution in the number of birds is considered as being due to the extension of agriculture, the slaughter of birds for food and for adornment, the collection of birds for museums, and wanton destruction. In counteracting these tendencies, the use of traps and nets should be prohibited and protection should be afforded birds particularly during the nesting and migrating seasons.

The food of the birds, F. L. Berney (*Emu*, *7* (*1907*), *No. 2, pp. 79-81*).—The stomach contents were examined of a considerable variety of birds including robins, pigeons, thrush, larks, cuckoos, etc. Attention is called to the difficulty of making accurate determinations of all insects and species of plants found in birds' stomachs.

The food of the crow blackbird, H. GARMAN (*Kentucky Sta. Bul. 130, pp. 19–41, figs. 3*).—The habits of the crow blackbird in Kentucky are discussed in considerable detail. A number of these birds were shot in April, May, July, August, September, October, and November of 1906. A careful examination of the stomach contents indicated that the food consisted of 63.08 per cent vegetable material and 36.92 per cent insects. The percentage of insect food rises from May to July and then falls suddenly in August. Much of the grain which is eaten is believed to be gleaned and therefore of no value, and the author comes to the conclusion that the crow blackbird is beneficial rather than harmful. Copies are given of a number of letters from farmers containing their opinions of the economic status of this bird.

Insectivorous birds and injurious insects, G. SEVERIN (*Bul. Soc. Cent. Forest. Belg., 14 (1907), Nos. 9, pp. 536–548; 10, pp. 600–609*).—A list is given of various agricultural and horticultural crops with notes under each crop on the most important insect pests and the agency of birds in destroying them.

Study of insects: Homoptera. Economic entomology. Robins, H. A. SURFACE (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 3, pp. 67–96, pls. 8*).—A general systematic account is given of 8 families of homoptera. Biological and economic notes are also presented on grain moth, rose bug, and flea-beetles. The subjects of spraying and the economic status of the robin are also discussed.

Combating injurious insects (*Bul. Soc. Cent. Forest. Belg., 14 (1907), Nos. 6, pp. 338–354; 7, pp. 411–426; 8, pp. 474–488*).—A general account is given of the results obtained by various investigators on the importance of insectivorous birds and parasitic and predaceous insects in the control of insect pests.

Directions for treatment of insect pests and plant diseases, E. D. SANDERSON (*Rpt. Bd. Agr. [N. H.], 29 (1905–6), pp. 151–175*).—Directions are given for the treatment of orchard fruits, shade trees, gardens and greenhouse crops for the control of insect pests and fungus diseases. Formulas are given for the preparation of suitable remedies.

Report of nursery inspector, E. D. SANDERSON (*Rpt. Bd. Agr. [N. H.], 29 (1907), pp. 287–294*).—An inspection was made of the three nurseries which are located in the State. A brief account is given of the conditions observed on these premises and also of the present status of the brown-tail and gipsy moths.

Nursery and orchard inspection. Economic entomology, H. A. SURFACE (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 4, pp. 97–128, pls. 2*).—A list of Pennsylvania nurserymen is given with brief notes on nursery inspection, tree dealers, orchard inspection, household fumigation, and the treatment of seeds for insect pests, together with a brief account of the stalk borer.

Further researches on North American Acridiidæ, A. P. MORSE (*Carnegie Inst. Washington Pub. 68, pp. 54, pls. 10*).—Studies were made on the ecology and distribution of locusts in the region from Tennessee to Texas. Short-winged species were more numerous in humid than in arid regions. Observations were also made on the coloration of locusts and on their local distribution in various areas.

The eastern plague locust, W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 18 (1907), No. 6, pp. 539–541, pl. 1*).—Several species of locusts have occurred in swarms in New South Wales. In the present article attention is given to *Œdaleus senegalensis*, which has caused great damage to grass and cultivated crops. Brief mention is made of insect and fungus parasites observed on these locusts.

Locusts in India, H. M. LEFROY (*Agr. Jour. India, 2 (1907), No. 3, pp. 238–245, pls. 7*).—Two species of locusts, *Acridium succinctum* and *A. peregrinum*, are particularly injurious in India. The life history of these pests is briefly outlined. *A. peregrinum* is well-known as a species which occurs in large numbers, while *A. succinctum* as a rule does not occur in swarms outside of India.

Insects and diseases of corn and sugar cane and related plants, M. T. Cook and W. T. Horne (*Estac. Cent. Agron. Cuba, Bul. 7, pp. 30, pls. 10*).—Among the corn pests of Cuba mention is made of *Laphygma frugiperda*, bollworm, white grubs, army worm, changa, grasshoppers, smut, and rust. The most important enemies of sugar cane are *Diatræa saccharalis*, leaf hoppers, and ring-spot disease. Brief mention is also made of insect pests and fungus diseases of Kafir corn.

The corn rootworms, H. Garman (*Kentucky Sta. Bul. 130, pp. 42-46*).—The southern corn rootworm (*Diabrotica 12-punctata*) is the species which does most harm in Kentucky, as the northern corn rootworm (*D. longicornis*) is rare in the State and can scarcely be considered of economic importance. The remedies which have been worked out for the northern corn rootworm do not apply to the southern species, for the reason that the latter is not single brooded and apparently does not pass the winter in the egg stage. The author finds that the adult beetles live through the winter. The adoption of a good system of rotation of crops is suggested as a means likely to assist in controlling the southern corn rootworm. In the meantime further investigation is necessary as a basis for more effective remedies. A comparative statement is given of the life history of the northern and southern species.

The pests of introduced cottons, H. M. Lefroy (*Agr. Jour. India, 2 (1907), No. 3, pp. 283-285*).—Foreign varieties of cotton introduced into India are particularly liable to insect attack, the most important pests of such varieties being leaf hopper, aphis, leaf roller, stem borer, and bollworms. In preventing injuries from these insects some benefit may be expected from, pruning tree cottons during the hot season of each year, rotating annual cottons with other crops, and destroying all stems and trash about the field at the end of the growing season.

An insect enemy of kitchen gardens, J. Vercier (*Jardin, 21 (1907), No. 497, pp. 330, 331, fig. 1*).—*Oryctes nasicornis* is described and a brief account is given of its attacks upon garden legumes and other crops.

Greenhouse pests and their control, H. T. Fernald (*Mass. Crop Rpt., 20 (1907), No. 6, pp. 29-38, fig. 1*).—Short notes are given on plant lice, white flies, thrips, cutworms, snails, red spiders, scale insects, and mealy bugs in greenhouses. These pests may be controlled by syringing with water, by fumigating with tobacco, carbon bisulphid, or hydrocyanic-acid gas, or by dipping in tobacco water, soap mixtures, or other insecticides.

The early stages of the oriental moth, H. T. Fernald and J. N. Summers (*Ent. News, 18 (1907), No. 8, pp. 321-327, pls. 2, fig. 1*).—Since the early stages of *Cnidocampa flavescens* had not been described the authors obtained a large series of eggs and from the larvæ hatched therefrom secured material for the description of the insect in all of its immature stages.

The excessive abundance of apple moths, G. Korff (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 5 (1907), No. 10, pp. 112-116*).—During the year *Simæthis pariana* occurred in great numbers injuring fruit trees, birches, willows, and other shade trees. It is difficult to control this insect by direct application of sprays, but considerable benefit may be derived from collecting all fallen leaves in which the larvæ may be concealed.

Papers on deciduous fruit insects and insecticides. The lesser apple worm, A. L. Quaintance (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 5, pp. 49-60, pl. 1, fig. 1*).—*Enarmonia prunivora* has caused considerable injury to apples during the past 3 years. This insect was first observed in 1867, and is apparently a native species. It has a wide distribution in the United States and has been found on crab apples, apples, plums, elm, oak, and other plants. The injury caused by the first brood of larvæ may be particularly extensive, the calyx end of the apple being most injured. Later in the season the blossom end is attacked and the larvæ show a tendency to penetrate into the fruit.

The insect is described in all its stages. Its life history is not known in all details but apparently resembles that of the codling moth rather closely. The winter is passed in the larval condition. There are at least two generations annually. From a similarity of habits between the lesser apple worm and the codling moth it is believed that the former may be effectively controlled by the usual system of spraying adopted for the codling moth.

The apple-tree tent caterpillar, A. L. Quaintance (*U. S. Dept. Agr., Bur. Ent. Circ. 98, pp. 8, figs. 4*).—The tent caterpillar is a native American species generally distributed throughout the country. A description is given of the insect in its various stages and notes are presented on its natural enemies, of which 24 species are known.

In combating this insect attention should be given to the egg clusters, the caterpillar nests, and to spraying with arsenicals. Good results should be expected from the use of Paris green at the rate of 1 lb. to 300 to 400 gal. of water.

The codling moth, R. S. Woglum (*N. C. Dept. Agr. Ent. Circ. 20, pp. 16, figs. 7*).—The appearance and life history of this insect are briefly considered. In North Carolina it is believed that 2 or 3 applications of arsenate of lead or some other arsenical would be sufficient for the control of the codling moth, but that on account of the prevalence of fungus diseases it is best to combine the arsenical with the Bordeaux mixture and make about 4 applications. Brief notes are also given on banding trees.

The peach lecanium or terrapin scale, A. B. Gahan (*Maryland Sta. Bul. 123, pp. 153–160, figs. 3*).—The peach lecanium or terrapin scale is widely distributed in Maryland, occurring on the peach, maple, plum, and other trees. The insect is described and notes are given on its life history and natural enemies. A fungus disease observed on this pest is closely related to if not identical with *Cordyceps clavulata.* It is believed that this fungus may become of economic importance.

One application of kerosene emulsion during the growing season can not be relied upon to suppress the peach lecanium, but good results are to be expected from the use of lime-sulphur wash in spraying just before the leaves start. Various proprietary preparations of miscible oils are also fairly effective.

The San José scale, A. F. Conradi (*South Carolina Sta. Bul. 134, pp. 20, figs. 12*).—A general account is presented of the history, appearance, biology, distribution, food plants, and means of combating San José scale. Directions are given for preparing lime-sulphur wash according to the formula 21 lbs. of lime and 18 lbs. of sulphur per 50 gal. of water, to be boiled for 45 to 60 minutes. It is urged that the orchardist should depend largely upon the application of this wash to his trees in winter. Brief notes are also given on other insecticides including whale-oil soap, kerosene, and crude oil.

Spraying for San José scale, T. B. Symons and G. P. Weldon (*Maryland Sta. Bul. 123, pp. 139–152, figs. 2*).—The San José scale is found in a large majority of the orchards of Maryland, and orchardists are doing more spraying for its control than has hitherto been the case. Attention is called to the agency of osage orange hedges in distributing the pest.

Experiments reported in spraying for this insect were conducted on two badly infested orchards. A number of proprietary oil mixtures were used and also lime and sulphur prepared according to the formula 20 lbs. of lime and 15 lbs. of sulphur per 50 gal. of water. All of the petroleum mixtures proved fairly satisfactory, but it is stated that perhaps no one would be justified in giving up lime-sulphur wash for any of these preparations. If a serious infestation of San José scale should occur in summer, the trouble may be somewhat relieved by spraying with a 20 per cent kerosene emulsion.

The use of soluble oils against San José scale, W. W. CHASE (*Ga. Bd. Ent. Circ. 6, pp. 11, figs. 4*).—A number of proprietary and miscible oil preparations were tested against San José scale. These appeared to be about equally efficacious, as compared with lime-sulphur-salt wash, which is also highly efficient, and have the one advantage of being more easily applied.

The sulphur-lime wash, A. L. MELANDER (*Washington Sta. Popular Bul. 2, pp. 4*).—The formula recommended for sulphur-lime wash is 1 lb. sulphur and 1 lb. lime per 4 gal. water. The mixture should be boiled for 30 minutes to 1 hour. Directions are given for the application of this wash in the treatment of various scale insects and other pests.

Phylloxera vastatrix, H. STAUFFACHER (*Ztschr. Wiss. Zool., 88 (1907), No. 1, pp. 131–152, pl. 1, figs. 5*).—An elaborate description is given of the anatomy of this insect in its immature and adult forms, together with notes on its life history.

The bagworm, L. O. HOWARD and F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Circ. 97, pp. 10, figs. 11*).—During 1907 the bagworm caused an unusual amount of injury in various parts of the country. This insect is a general feeder, but appears to prefer arborvitæ and other evergreens. Notes are given on its habits, life history, and natural enemies. On deciduous trees the insect may be controlled by picking off the bags in winter. On evergreens this is more difficult, but the pest may be controlled by spraying with Paris green at the rate of 1 lb. per 150 gal. of water.

Observations on Chermes pini, P. MARCHAL (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 29, pp. 340–342*).—The stem mothers are found in the first larval stage at the base of the leaves of *Picea orientalis*. The winged migrants migrate to species of pines (*Pinus sylvestris* and *P. strobus*). Other points in the life history of this insect are mentioned together with notes on its distribution.

A mite accompanying the bud rot of carnations, R. H. WOLCOTT (*Nebraska Sta. Bul. 103, pp. 25–31, pls. 2*).—In connection with the bud rot of carnations a mite was found in affected flowers which is described as a new species under the name *Pediculoides dianthophilus*. This mite belongs to the family Tarsonemidæ and is viviparous. It apparently is concerned in distributing the fungus which causes bud rot.

Ants, C. E. HOOD (*Massachusetts Sta. Circ. 7, pp. 2*).—*Monomorium pharaonis* may usually be destroyed by pouring bisulphid of carbon or kerosene emulsion into the nest. The use of sweetened baits is also recommended.

The grouse fly, D. SHARP (*Ent. Mo. Mag., 2. ser., 18 (1907), No. 207, pp. 58–60*).—*Lagopus scoticus*, a common species of grouse in Scotland, was found to be quite regularly infested with a fly which is described as a new species under the name *Ornithomyia lagopodis*.

The ox warble fly and means of combating it (*Landw. Wchnbl. Schles. Holst., 57 (1907), No. 35, pp. 570–573, figs. 5*).—The life history of the warble fly is briefly outlined. In the author's opinion, the best means of combating the pest consists in removing the larvæ from the skin of infested animals as soon as they have reached a size sufficient to enable the cattle raiser to detect them. It is suggested that cattle raisers should combine and work cooperatively.

Experiments with Paris green, A. TULLGREN and C. G. DAHL (*Meddel. K. Landtbr. Styr. [Sweden], 1907, No. 6 (125), pp. 45*).—During the seasons

1905–6, tests were made of Paris green alone, in water, and with Bordeaux mixture. It was found that stone fruits are not affected by Paris green when used at the rate of 50 to 150 gm. per 100 liters of water. A number of varieties of apples, particularly Ribston, Cox Orange, Gravenstein, etc., showed round burned areas upon the foliage after spraying with Paris green, but the injuries were so slight as to be of little importance in the growth or yield of the trees.

As compared with Paris green arsenate of lead produced less injury upon the foliage.

Spray calendar, W. E. Britton and G. P. Clinton (*Connecticut State Sta. Bul. 159, folio*).—Directions are given for the preparation of a few of the more important insecticides and fungicides. An alphabetical list is presented of important agricultural crops with annotations on their most important insect enemies and diseases and the methods of treating them.

Drones, F. d'Autemarche (*Apiculteur, 51 (1907), No. 10, pp. 417–420*).—In the opinion of the author it is probable that drones are of considerable value in helping to increase the internal heat of the beehives.

The ripening and maturing of honey, I. Hopkins (*Aust. Bee Bul., 16 (1907), No. 6, pp. 121–124*).—The water content of honey varies from 12 to 23 per cent, being least in thoroughly ripe samples. It is of importance to mature honey completely before placing it on the market, otherwise the high water content may allow serious fermentation and destruction of the flavor.

Analyses of beeswax, K. Dieterich (*Pharm. Post, 40 (1907), No. 38, pp. 639–641; Chem. Ztg., 31 (1907), No. 79, pp. 987, 988*).—The author shows considerable differences in the physical and chemical characteristics of wax from combs at different ages, from those freshly made to those 5 years old, and includes in the article some notes regarding bee resin or "propolis."

Horizontal honey extractor, C. Jungfleisch (*Apiculteur, 51 (1907), No. 9, pp. 366–371, figs. 5*).—A detailed description is given in connection with illustrations of a horizontal honey extractor suitable for use by the practical bee raiser.

The physiological influence of partial disinfection of the food of the silkworm, D. Lo Monaco (*Arch. Farmacol. Sper. e Sci. Aff., 6 (1907), No. 8–9, pp. 444–457*).—For some time experiments have been made in testing the effect of sterilizing mulberry leaves by the use of a dilute solution of fluorid of silver and in feeding these disinfected leaves to silkworms. As a result of this procedure the author observed an increase of 11 per cent in the weight of the cocoons and a diminution of 8 per cent in the mortality of the silkworms.

FOODS—HUMAN NUTRITION.

Quality in wheat, C. E. Saunders (*Canada Cent. Expt. Farm Bul. 57, pp. 1–36*).—Using wheats grown in 2 seasons questions of quality with respect to wheat and flour were studied, the samples being ground specially for the investigations in an experimental mill. Of the numerous varieties tested, Red Fife stood first in the 2 years' work as regards baking strength, volume, and shape of loaf, Laurel ranking lowest the first year and Grant and Ebert the second year. Of the varieties tested in 1906–7 the following yielded flour of high strength: Bobs, Chelsea, Marquis, Early Russian, Gatineau, Haynes Blue Stem, Outlook, Hungarian White, Red Fern, and White Fife C. The author states that Colorado, Herisson Bearded, and White Russian "are of rather low strength and are, therefore, not suitable for the production of extremely light bread or for export to countries desiring strong flour."

Two durum wheats were included in the investigation and the results, according to the author, show conclusively that the common custom of regarding all these wheats as of one quality is absurd. "While the ordinary Goose (or Wild Goose) can not be recommended for bread baking, the Kubanka produced admirable bread, which, however, differs in some ways from that produced from most of the other wheats. The Kubanka dough must be made rather stiff in order that it may not be too sticky to handle conveniently. It rises very well, producing a large loaf of very fine texture and of good form. The crust is somewhat unusual, being of a rich brown color and having a tendency to be thin and tough. The inside color of the bread is quite yellow, but this gives an appearance of richness and can only be objected to on the grounds of prejudice. Taking all its characteristics into consideration, . . . the bread produced from this sample of wheat was of excellent quality."

Of the winter wheats, Dawson Golden-Chaff was rather low in strength but produced good bread of pale appearance and rather compact character. Padi wheat, the author considers unworthy of general cultivation, particularly on account of the greenish-yellow color of the inside of the loaf. Reference is also made in the report to the characteristics of other varieties tested.

As regards the effect of storage on quality, it was found that flour stored a year improved in every respect, "taking up a larger amount of water, retaining more, giving a loaf of larger volume and of better shape, crust, texture and color. The behavior of the dough in the oven was most remarkable. While in the first tests, with a water absorption of 59 per cent the dough had a tendency to fall, after the 12 months' keeping, although the water was increased to 62 per cent, the dough had the ability to rise to a most remarkable degree when put into the oven. The sample of flour was kept for the 12 months under dry conditions in a glass-stoppered bottle. It would appear that this astonishing change in baking strength must have been due to an improvement in the quality of the gluten, as it could scarcely be explained on any other supposition."

The author does not consider appearance a trustworthy indication of quality. "There is no doubt some justification for the preference of bright samples of grain, that is, those which are free from blemishes, usually caused by frost or rain; but it is quite uncertain in many cases to what extent the actual quality of the interior of the kernel has been lowered when there is evidence of injury to the bran. It is often highly probable that the interior of the berry is in essentially perfect condition even though the bran may be dull and unattractive."

Contrary to the opinion of some other investigators, it was found that flours mixed in equal proportions gave, when baked, results which were a very close average for the varieties used.

In the principal tests reported bread was uniformly made with a large proportion of yeast, so additional investigations were undertaken to determine whether the method influenced the quality of the product, but none of the variations tested materially changed the rank of the different flours as already determined.

The author also studied the quality of the flour when used with baking powder. "All the flours tested produced biscuits of about the same volume and though they differed somewhat in character and considerably in color, the differences were not so striking as those observed in bread. It appears that almost any flour will make tea biscuits of fair quality. The experiments show that the flours tested had sufficient strength of gluten to attain the necessary volume when the gluten had not been subjected to the prolonged influence of the yeast fermentation, and when the quantity of gas evolved was not very large. For it must be borne in mind that even a well-made tea biscuit has a small volume compared with that of a very light loaf of bread produced from the same quantity of flour. In spite of the similarity in conduct of the various flours, under the conditions just mentioned, it is clear that one is not justified in concluding either that the gluten of all flours is practically identical or that the volume of a light loaf of bread is determined primarily by the quantity of gas evolved. The making of ordinary tea biscuits can not be considered a test of the ability of gluten to withstand fermentation or of its power to retain a large quantity of gas produced inside the dough."

The relationship of composition to bread-making value, F. T. Shutt (*Canada Cent. Expt. Farm Bul. 57, pp. 37–51, dgms. 3*).—Studies of the gluten and the sugar content of a number of sorts of flour were carried on in an investigation of the relation between composition of flour and bread-making value. The following quotations are made from the author's summary:

"Between the protein, gliadin, and wet and dry gluten there is a distinct relationship, but . . . there is no evidence of a definite or absolute ratio. It is apparently approximate in character. . . .

"The 'gliadin number,' though holding with the other nitrogenous data in certain parts of the series, is evidently a datum not to be considered as definitely related to the nitrogen compounds or to the 'baking strength.'

"While it may not be possible to prognosticate from the nitrogen determinations (protein, gliadin, and gluten) the particular order in which the members of any series of flours will fall when submitted to a baking test, these estimations constitute factors of prime importance in judging of the value of a flour for bread-making purposes, and especially is this true when taken into consideration with the physical character of the gluten. The results from both series of flours clearly indicate a distinct relationship between these chemical data and 'baking strength'—a figure made up chiefly of the values for volume, shape, and weight of loaf. It does not appear, however, that any definite ratio can be established between these two classes of data.

"If the size of the loaf produced is controlled by the volume of gas evolved in the bread-making process, then this volume is dependent on the degree of the enzymic action (which may affect the proteids as well as the carbohydrates) rather than on the amount of sugar present in the flours.

"No relationship has been discovered between the ratio of total ash to protein and 'baking strength,' nor between the ratio of ash in gluten to protein and 'baking strength.'"

Breakfast foods: Their chemical composition, digestibility, and cost, R. Harcourt and H. L. Fulmer (*Ontario Dept. Agr. Bul. 162, pp. 56*).—A full report on the composition and digestibility of cereal breakfast foods and the effects of different methods of cooking. Portions of this work and the general conclusions drawn from it have been noted from other publications (E. S. R., 19, p. 59). Additional analyses are reported.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 84–85, pp. 4; 86, pp. 16; 87, pp. 2; 88, pp. 2*).—These circulars contain amendments to Regulations 17 and 19 of Rules and Regulations for the Enforcement of the Food and Drugs Act (E. S. R., 18, p. 459), and decisions regarding the labeling of bitters, the interpretation of Regulation 2 as to the original packages, labeling of corn sirup, and information regarding private importations. "Notice is given that these so-called private importations will be subjected to the same restrictions as ordinary imports."

As regards "the thick viscous sirup obtained by the incomplete hydrolysis of the starch of corn, and composed essentially of dextrose, maltose, and dextrin, in our opinion it is lawful to label this sirup as 'corn sirup,' and if to the corn sirup there is added a small percentage of refiner's sirup, a product of the cane, the mixture, in our judgment, is not misbranded if labeled 'corn sirup with cane flavor.'"

Food products, E. H. Jenkins (*Connecticut State Sta. Rpt. 1907-8, pt. 2, pp. 121-126*).—A discussion of the State pure food laws and a brief summary of the station's contributions to methods and results.

Twelfth report on food products, A. L. Winton (*Connecticut State Sta. Rpt. 1907-8, pt. 2, pp. 127-164*).—Under the provisions of the State pure food law 1,594 samples collected by the station and sampled by the dairy commissioner, and contributed by health officers, consumers, and dealers have been examined, including buckwheat flour, catsup and similar goods, chocolates and cocoas, coffee, maple sirup, olive oil, spices, flavoring extracts, molasses, honey, lard, milk and other dairy products, cream of tartar, etc.

Of the 80 samples of buckwheat flour examined, 27 were found to be adulterated. In case of chocolate, 8 of the samples were found to be adulterated or below standard, 1 was labeled compound, and 18 were not found to be adulterated. Of 111 samples of lard examined, 23 were adulterated or below standard and 2 marked compound. With olive oil, 73 samples were not found adulterated, 11 were adulterated or below standard, while 1 was labeled compound. No adulteration was found in 45 samples of honey, while 1 sample was adulterated or below standard and 3 were marked compound.

An examination was made of coffees from which it was claimed that the caffetannic acid and caffein had been removed but it was not found that the claim was substantiated, such goods showing from 9.45 to 9.96 per cent caffetannic acid and from 1.11 to 1.14 per cent caffein in comparison with 9.47 to 9.96 per cent caffetannic acid and 1.13 to 1.26 per cent caffein in samples of standard coffee for which no such claim was made.

"From the above results it is obvious that the coffees claimed to have been treated by a special process to eliminate the injurious constituents contain practically the same amount of tannic acid and caffein as ordinary coffee. If they are less injurious to health, it must be for other reasons."

As it is claimed that the removal of the chaff diminishes the caffetannic acid content, studies were made of the percentage of chaff in roasted coffee beans and determinations were made of the percentage of crude fiber and caffetannic acid of such chaff. In the case of caffetannic acid the values were found to range from 5.46 to 7.55 per cent in the 3 samples examined. "These figures show that the percentage of tannic acid in the chaff, instead of being more than in the remainder of the bean, is considerably less and its removal would tend to actually increase the percentage tannic acid content of the product, although, owing to the small percentage of chaff in the bean, the increase would be very slight."

The influence of inanition on metabolism, F. G. Benedict (*Carnegie Inst. Washington Pub. 77, pp. VI+542*).—The primary object of this report is to present an accurate statement of the results of an extended series of experiments with men on the effect of inanition on metabolism. The plan and purpose of the experiments and the method of the investigation are described in the introductory portion of the volume and studies of fasting which have been reported by other investigators are reviewed. The author's experimental work is reported in full, detailed statistics being given of 18 general metabolism experiments of 1 to 7 days' duration and of 2 nitrogen metabolism experiments lasting respectively 25 and 14 days. The measurements included in most cases complete data as to income and outgo of matter and energy measured with the respiration calorimeter and accessory appliances, together with observations of body weight, body temperature, pulse and respiration rate, strength tests, and blood examinations. The respiratory exchange and the heat output were subjects of special study. Experiments during prolonged fasting were included to note fluctuations from day to day and a series of 2-day fasts with a number of men was carried on to eliminate the influence of individuality. In the longer experiments the subject was a young man, who claimed some previous experience in fasting and in the remainder the subjects were college students. The results are summarized and discussed in detail.

In general, the fluctuations in body weight were very considerable, not only from day to day in a given experiment, but in experiments with different subjects and in different experiments with the same subject. As shown by data for the quantities of protein, fat, and glycogen katabolized on different days during the fasting period, it was evident that while there may be marked fluctuations in the loss in body weight these fluctuations in practically all instances must be due to the quantity of water consumed and urine excreted. The actual daily loss in weight was found to vary from 44 gm. to 1.7 kg.

Body temperature undergoes normal, rhythmical fluctuations. The observations on fasting subjects showed that in general the fluctuations were much smaller during inanition than when food is taken.

Important deductions were drawn from the studies of the effects of fasting upon the blood. A progressive average fall in the number of erythrocytes was noted during inanition with recuperation following. A corresponding diminution in the percentage of hemoglobin was also noted. In the prolonged fast a relative progressive fall in the percentage of leucocytes was observed but no remarkable effect of fasting on the relative percentages of the various types of leucocytes was noted. A high percentage of polymorphonuclear leucocytes observed during the fasts is explained by the relative leucocytosis.

The common assumption is that as fasting progresses strength diminishes rapidly, though the contrary has been claimed in some instances of professional fasting. In the experiments reported strength tests were made and in almost every instance a notable falling off in strength was observed as the fast progressed. When food was again taken strength rapidly returned.

The body excretions were the subject of special study. In the case of feces it was found practically impossible to isolate, with any degree of accuracy, material which could properly be designated "fasting feces." The urine was excreted regularly. The volumes were in general normal though in many cases where the subject consumed large volumes of water the amounts excreted were likewise great. Considerable variation in the amount of total urinary nitrogen was noted, but even in the longer experiments the daily output seldom fell below 10.5 gm. Detailed data are also given regarding the variations in excretion of other urinary constituents.

Marked variations in the amount of water vapor given off by the skin and lungs were observed in experiments with different subjects and smaller variations in experiments with the same subject. On an average, the results show that a fasting man gives off in this way not far from 600 to 800 gm. of water per day.

As the fasting period progressed a rather persistent decrease in the carbon dioxid output was noted. In the 2-day fasting experiments wide variations in the carbon dioxid output were observed with different subjects, though considering the period as a whole the agreement was reasonably uniform. Much wider differences were noted between the oxygen intake on the different days than was the case with the carbon dioxid output.

The recorded data furnish information regarding the amounts of protein, fat, and glycogen katabolized in the body. The results show that the greatest draft on body glycogen occurred on the first day of fasting. After this a marked decrease in carbohydrate metabolism was noted and on the second, third, and subsequent days not far from 20 gm. of glycogen per day was lost on an average.

The average heat production in the fasting experiments was found to be not far from 2,000 calories per day on the first 2 days of the fasting period. When the experiments were continued longer the heat production diminished and the author believes that 1,500 to 1,600 calories per day may be considered as approximately the minimum heat production of a man at rest without food. During sleep the heat production of such a man falls to 56 calories per hour or at the rate of about 1,350 calories per day.

The recovery from fasting was rapid and the author is of the opinion that there is a marked tendency on the part of the body to accumulate fat after short periods of fasting.

Other general and physiological questions are also discussed.

Metabolism during inanition, F. G. BENEDICT (*N. Y. Med. Jour. and Phila. Med. Jour.*, *86* (*1907*), *No. 12*, *pp. 527-536*).—A brief discussion of results reported in full in the publication noted above.

ANIMAL PRODUCTION.

The available energy of red clover hay, H. P. ARMSBY and J. A. FRIES (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 101*, *pp. 61*, *dgms. 4*).—In continuation of work previously reported (E. S. R., 17, p. 579), respiration calorimeter experiments were made with a steer to secure additional data regarding the available energy of red clover hay. The general plan was to feed the animal 3 different amounts of hay, all of them less than the maintenance requirement, and to study metabolism on each ration at different temperatures. It was found, however, that the possible range of temperature in the respiration calorimeter chamber was so limited that the results regarding the influence of this character are not considered decisive.

According to the authors' results, 46.28 per cent of the gross energy of the clover hay was metabolizable on an average, while 40.96 per cent was lost in the feces, 6.81 per cent in the urine, and 5.95 per cent in methan. Considering the energy of digested matter only 78.39 per cent was metabolizable, 11.54 per cent escaping in the urine and 10.07 per cent in methan.

In the 3 experiments the total heat production at a temperature of 19° C. was 10,911, 11,435, and 10,724 calories, and in the experiments at a temperature of 13.5° C. it was 11,736, 11,318, and 10,874 calories. The authors point out that while the differences in heat production at the 2 temperatures were not great, marked differences were noted in the channel of excretion, a much less proportion being removed as latent heat of water vapor and correspondingly more by radiation and conduction at the lower temperature. The relative humidity of the air did not appear to have been an important factor in the marked decrease in the evaporation of water noted at the lower temperature.

On the basis of available data, the authors compute the minimum energy requirements of a steer weighing 500 kg. to be 9,354 calories in their earlier series of experiments and 9,527 calories in the experiments now reported.

From the data at hand the authors have recalculated the relative values of timothy hay, clover hay, meadow hay, and maize meal, using timothy hay as a standard. The results follow:

Relative values.

Feed.	Per kilogram total dry matter.		Per kilogram digestible organic matter.	
	For maintenance.	For fattening.	For maintenance.	For fattening.
Timothy hay	1.00	1.00	1.00	1.00
Clover hay	1.20		1.07	
Meadow hay		1.27		1.15
Maize meal	2.11	2.73	1.21	1.56

The clover hay used in the experiments reported was analyzed.

Notes on the digestibility of pentosans, M. S. McDowell (*Pennsylvania Sta. Rpt. 1906, pp. 94–98*).—In connection with steer feeding experiments made with the respiration calorimeter and reported in part (E. S. R., 17, p. 579) the digestibility of pentosans in rations of clover hay and corn meal, of clover hay alone, and of timothy hay and bran was studied. The average digestibility of pentosans of clover hay alone was 60.75 per cent, of timothy hay alone 57.18 per cent, of corn meal fed with clover hay 94.73 per cent, and of bran fed with timothy hay 66.39 per cent.

"The effect of the corn meal has apparently been to increase the digestibility of the hay. The corn meal, containing a comparatively small amount of pentosan, when fed in small quantities especially emphasizes this fact. . . .

"While the pentosans are apparently as digestible as the other plant substances, it must be born in mind that apparent digestibility does not necessarily mean food value."

Commercial feeding stuffs, 1907, E. H. Jenkins and J. P. Street (*Connecticut State Sta. Rpt. 1907–8, pt. 3, pp. 165–209*).—Under the provisions of the State law, 197 samples of feeds were collected and examined chemically and microscopically. Forty samples sent to the station by individuals were also analyzed. The materials examined included cotton-seed meal, old and new process linseed meal, wheat bran, middlings, and mixed feed, maize meal, gluten feed, hominy feed, rye bran, middlings, and feed, buckwheat middlings, ground rice, rice bran, beet pulp, ground peas and beans, malt sprouts, dried distillers' grains, dried brewers' grains, commercial mixed feeds, flax feed, proprietary dairy and stock feeds, proprietary poultry feeds, meat scrap, and peanut refuse.

Some of the samples examined were not guaranteed as required by law. In most cases the goods seem to have met the guaranty, though this was not the case with respect to 4 out of 11 samples of cotton-seed meal and 5 out of 9 brands of gluten feed.

The digestibility of feeding stuffs, the purchase of commercial feeding stuffs, and related questions are discussed.

Commercial feeding stuffs, J. E. Halligan (*Louisiana Stas. Bul. 98, pp. 141*).—During the past season the station has analyzed 6,469 samples of commercial feeding stuffs under the State feed stuff law comprising cotton-seed meal, rice bran, rice polish, wheat products, molasses feeds, corn chops, corn and oat feeds, hominy, feed meal, brewers' grains, poultry feeds, alfalfa meal, corn bran, and commercial mixed feeds.

According to the classification adopted, 490 samples of the cotton-seed meal examined were choice, 185 prime, 39 good, and 35 inferior.

It was found that few of the rice brans were equal to or above the assumed standard, namely, 12.5 per cent protein, 10 per cent fat, not over 10 per cent crude fiber or 9 per cent ash, and showing no rancid odor. Some of the samples of rice polish examined contained grits and hulls. A few samples of wheat bran were found to be adulterated with corn bran, oat hulls, light oats, and weed seeds, and some samples contained screenings.

Of the molasses feeds, some samples showed poor mechanical mixture, though most of such feeds found in the Louisiana markets are considered to be of good quality. "It is necessary for the manufacturer to dry these feeds sufficiently to prevent decomposition. There were a few shipments where fermentation set in and spoiled the feed."

Some of the samples of corn chops were adulterated with corn cobs and many of these feeds were composed of very inferior corn. Some samples showed signs of previous fermentation. To determine whether fermentation could be detected by changes in composition a bright sample of corn chops of good quality was analyzed before and after fermentation but no differences were observed which would suffice for the detection of fermentation.

Considerable variation was noted in the composition of the corn and oat feeds. Some of the brands were fortified with dried brewers' grains, alfalfa, gluten feed, and other substances to increase their protein content. The brewers' grains examined were found to be free from rice hulls, which it is stated some Louisiana feeders believe are present, and were of good quality.

Molasses and molasses feeds for farm stock, J. B. Lindsey, E. B. Holland, and P. H. Smith (*Massachusetts Sta. Bul. 118, pp. 31*).—The feeding value and digestibility of molasses are discussed on the basis of work at the Massachusetts Station and elsewhere.

For fattening beef cattle the authors believe that some 3 lbs. of molasses per day may be fed advantageously, especially during the finishing process when the appetite is likely to prove fickle.

When molasses was tested for horses 2 lots of 2 animals each were used and were fed for 2 periods of 4 weeks each, the rations being reversed during the second period. The grain ration consisted of 7 lbs. per head per day of corn and oats about 2:1 and the molasses ration of 4 lbs. of molasses and 3 lbs. of the same grain mixture. Both lots were fed 15 to 18 lbs. of hay per head per day. On grain and hay there was a total loss of 45 lbs. and on the molasses ration a total gain of 20 lbs.

"The several horses were in good condition at the beginning of the trial and no particular effect, favorable or otherwise, excepting a logy condition, was noticed from the 4 lbs. daily of Porto Rico molasses. The feces maintained their normal condition in all cases. It is evident that the amount of molasses was out of proportion to the amount of grain fed.

"In spite of the many reports favorable to the use of molasses for horses, the writer is not inclined to recommend to northern farmers its indiscriminate use in place of the cereals and their by-products. As an appetizer and tonic for horses out of condition, as a colic preventive and for improving the palatability of rations, 2 to 3 lbs. daily of molasses undoubtedly would prove productive of satisfactory results."

Several rations containing molasses are suggested.

In a test of the value of molasses made with 2 pigs the maximum amount which could be fed with satisfaction was 57 oz. of molasses per head per day with 8 qts. of skim milk and over 40 oz. of hominy meal. After feeding for some 20 weeks the pigs were slaughtered.

"It was not possible to detect any abnormal condition of their internal organs, nor of their dressed carcasses. No particular study was made relative to the quality or chemical composition of the fat. It was noted that neither of the animals was excessively fat."

It is stated that satisfactory results were obtained at the Massachusetts Agricultural College farm when growing and fattening pigs were fed 50 lbs. of low-grade wheat flour stirred into a barrel of water to which a gallon of molasses was added after the mixture had been steamed for an hour or two until well thickened.

"If molasses is used for the nutrition of pigs, it must be mixed with foods reasonably rich in protein. If skim milk is not available, a combination by weight of 2 parts bran, 1 part gluten feed, 1 part corn meal and 1 part molasses; or 1 part tankage, 4 parts corn meal and 1 part molasses ought to prove satisfactory. The writer sees no particular advantage under ordinary conditions for the northern farmer to employ molasses for pig feeding other than as an appetizer."

In a test with 2 lots of 3 dairy cows each molasses and corn meal were compared, the test covering 2 periods of 5 weeks each, separated by an interval of 2 weeks, the ration being reversed in the second period. The molasses was diluted with water and mixed with dry grain before feeding. On the molasses ration there was an average gain of 10 lbs. and on the corn meal ration of 67 lbs. The daily milk yield on the 2 rations was 18.04 and 19.65 lbs., respectively, the corn meal ration showing an increase over the molasses ration of 11.3 per cent total milk solids and 13.1 per cent total milk fat. The cost of 100 lbs. of milk on the 2 rations was $1.28 and $1.19 and the cost of 100 lbs. of butter $21.50 and $19.41, respectively.

According to the authors—

"Any particularly favorable effect of Porto Rico molasses upon the general health and appearance of the 6 milch cows employed in the above-described experiment was not observed. The feces from the molasses-fed animals were darker in color and softer than from those receiving the corn-meal ration.

"A daily ration containing nearly 4 lbs. of corn meal produces some 10 per cent more milk and 11 to 13 per cent more total solids and fat than a similar basal ration containing a like amount of Porto Rico molasses.

"The molasses ration seemed to produce milk with slightly less fat and solids-not-fat than did the corn-meal ration.

"A like amount of milk and butter from the molasses ration cost 8 to 11 per cent more than from the corn-meal ration.

"Molasses did not produce any unfavorable effect upon the flavor of the milk. . . .

"All things considered, the writer does not see any advantage to be gained by northern farmers from the use of molasses as a food for dairy stock in place of corn meal and similar carbohydrates. As an appetizer for cows out of condition and for facilitating the disposal of unpalatable and inferior roughage and grain, 2 to 3 lbs. of molasses daily undoubtedly would prove helpful and economical."

When a commercial molasses feed was compared with wheat bran and gluten feed, the total milk yield of 4 cows on the former ration was 7,357.4 lbs. and on the bran and gluten ration 7,639.6 lbs. According to the authors' calculations, there was an increase of 6.8 per cent total solids and 6 per cent total butter fat on the bran ration as compared with the commercial feed ration.

In a test with another commercial molasses feed the average daily milk yield on the molasses feed was 16.76 lbs. and on the bran and gluten feed 18.61 lbs., the bran and gluten ration being superior by 13.2 per cent total solids and 14 per cent total butter fat.

Brief notes are also given regarding an additional test which was discontinued. The composition and digestibility of molasses, the value of molasses feeds, and other related questions are discussed, some of the data summarized having been noted from an earlier publication (E. S. R., 19, p. 264).

Grains to supplement skim milk for calves, J. R. Fain and M. P. Jarnagin (*Virginia Sta. Bul. 172, pp. 81–94, fig. 1*).—Shelled corn alone and with bran 4:1, corn meal and bran 4:1, and cracked barley and bran 4:1 were compared as supplements to skim milk in calf feeding. The system of feeding gave satisfactory results, according to the authors, and was as follows:

"Ten lbs. of milk for the first 100 lbs. of live weight, 5 lbs. of milk for the second 100 lbs. of live weight, and 2.5 lbs. of milk for the third 100 lbs. of live weight. Until the calf was 3 months old 1 lb. of grain to 10 lbs. of milk was fed. From 3 to 6 months old 1 lb. of grain to 5 lbs. of milk was fed."

All the calves had access to hay from the start, the amount consumed daily, as shown by a test with calves kept in box stalls for several days at a time, being approximately 1 lb. per each 100 lbs. live weight. The lots were fed from 87 to 115 days, the gains ranging from 1.42 lbs. per head per day on corn meal and bran to 1.6 lbs. on shelled corn alone, and the cost of feed per pound of gain from 3.65 cts. with the last mentioned lot to 4 cts. with the lot fed cracked barley and bran.

When 4 beef calves were fed for 82 days shelled corn and bran 4:1 with skim milk and hay an average daily gain of 1.66 lbs. per head was noted at a cost of 5.45 cts.

A similar lot fed whole milk with shelled corn, bran, and blood meal 20:4:1 with hay in addition gained on an average 2 lbs. per head per day for 91 days at an estimated cost of a little over 10 cts. per pound of gain.

According to the authors, "the importance of hay for young calves can not be emphasized too strongly; they should have access to good, clean hay at all times. . . .

"The best results were obtained from shelled corn. The calves did not consume as much corn meal per day as shelled corn, nor did they make as large a rate of gain. It did not require as much shelled corn as corn meal per pound of gain. . . .

"Bran was used to great advantage in teaching the calves to eat grain, but no advantage was secured from adding bran to a ration of shelled corn to supplement the skim milk, either in rate of gain or the appearance of the calf. . . .

"Barley was found to be an excellent grain to supplement skim milk, but owing to its high marker price as compared with corn it did not show as good returns financially. However, it must be borne in mind that barley can be produced pound for pound as cheaply as the corn. . . .

"The group of calves fed whole milk made the largest gain, but at the highest cost per day and per pound of gain. They presented a better appearance before weaning, but at 8 months of age there was little difference either in weight or appearance between those developed on whole milk and those on skim milk."

In cases of scours calves were treated with formaldehyde with satisfactory results not only in the tests but also, according to the authors, in a large number of other cases.

The development of grade and cross-bred beef cattle, J. R. Fain and M. P. Jarnagin (*Virginia Sta. Bul. 171, pp. 45–79, figs. 9*).—A study was made of the relative development of the several parts of the animal body as determined by actual measurements of calves and grade and cross-bred cattle, and data were also secured regarding the laws of animal breeding. Measurements were made of animals of varying ages while on feed and on pasture and the results of a slaughter test are also included.

The authors' deductions follow:

"The development of beef-bred animals on skim milk for the first 3 months was not satisfactory, but it should be remembered that these figures represent the most unfavorable period of development on skim milk.

"The whole-milk calves from 1 to 3 months made much better gains, as shown in the weights and measurements, and appeared to much better advantage.

"The growth of the whole-milk calves from 1 to 3 months as shown by the measurements was about equal to that from 3 to 12 months. The weights, however, do not show this same relation, as the gains from 3 to 12 months were about twice that from 1 to 3 months.

"The growth of the whole-milk calves for the twelve-month period was quite satisfactory. The measurements would indicate that the development of the framework was largely made during this period.

"The growth as shown by average measurements for the 3 skim-milk calves from 1 to 3 months, the 3 whole-milk calves from 1 to 3 months, the 5 whole-milk calves from 3 to 9 months, and the 3 beef-bred animals from 9 months to the time of slaughtering, gives some idea of the increase that can be obtained in animals that are finished off at 2.5 years, weighing from 1,100 to 1,300 lbs.

"In finishing off the 5 animals whose measurements are shown from 9 months to the time of slaughtering, the Shorthorn-Holstein led with an average daily gain of 2.18 lbs., the Hereford-Shorthorn came second with a gain of a little over 2 lbs., while the Jersey was last with a gain of less than 1.5 lbs. per day. In growth from birth this same order holds good, except that the positions of the grade Shorthorn and the grade Angus are reversed.

"The 2 steers having dairy blood put on a pound of gain for somewhat less than those of the beef breeds."

The slaughter test showed that the Hereford-Shorthorns gave the best results with a showing of 58.3 per cent good meat. As regards quality, little difference was noted between the Hereford-Shorthorns and the grade Shorthorns, while Jerseys and Holsteins ranked lowest in this respect.

The value for live weight based on the percentage of dressed weight, according to the authors, showed that Hereford-Shorthorns ranked first and grade Shorthorns second, followed by Jerseys and Shorthorn-Holsteins.

Finishing beef cattle, A. M. SOULE, J. R. FAIN, and M. P. JARNAGIN (*Virginia Sta. Bul. 173, pp. 95-122, figs. 5*).—Using 4 lots of 5 grade steers each, ear corn, corn-and-cob meal, shelled corn, and corn meal were compared as supplements to a basal ration of cotton-seed meal, corn silage, hay, and corn stover. In the 149 days of the test it was found that the average gains per head per day were, respectively, 1.66 lbs., 1.81 lbs., 1.80 lbs., and 1.76 lbs. The smallest amount of concentrated feed per pound of gain was noted with the lot fed corn-and-cob meal, being equivalent to 4.27 lbs. of corn, and the largest amount of concentrated feed per pound of gain, 4.94 lbs. was noted with the lot fed shelled corn. In the case of coarse fodder the amounts ranged from 21.52 lbs. with the corn meal lot to 24.27 lbs. with the ear corn lot. When the cattle were shipped to market the shrinkage was much the same in all the lots, averaging only 41.2 lbs. per head. The dressed weight was 56.9 per cent of the live weight and the meat was of superior quality, the fat and lean being well blended and the color particularly good.

The value of silage without grain as compared with that of a mixture of corn-and-cob meal and cotton-seed meal successively with hay, corn stover, and corn silage for winter feeding of cattle designed for subsequent summer fattening on grass was studied with 4 lots of 5 steers each. In the 134 days in barn the gain ranged from 0.08 lb. per head per day on corn stover and grain to 1.22 lbs. on corn silage and grain. In the 105 days the steers were on pasture the greatest variation was also noted with these 2 lots, the silage-fed lot giving the smallest gain 1.58 lbs., and the stover-fed lot the largest, 2.85 lbs. Considering the test as a whole, the greatest gain, 1.43 lbs. per head per day, was found with the silage lot and the smallest, 1.11 lbs., with the concentrates and hay ration. The cost of a pound of gain ranged from 4.23 cts. with the grain and corn stover lot to 6.45 cts. with the grain and hay lot.

According to the authors, the results obtained substantiate the conclusions drawn from earlier work (E. S. R., 18, p. 1153) and emphasize the importance of grass as an adjunct in finishing cattle in the Appalachian region and the high value of corn silage as coarse fodder for cattle which are to be finished in the stall or carried through the winter and then fattened on grass.

"Owing to the laxative tendency of silage, it has been found advisable to feed a small amount of dry roughness. From 2 to 3 lbs. of shredded stover or timothy hay have proven ample, and, in view of the gains secured, we would not advise the use of larger amounts when the silage is of first-class quality. . . .

"There was enough difference in the gains obtained in this experiment to justify shelling the corn, but it is a question whether the practice would be profitable one year with another. The gains from corn meal and corn-and-cob meal were practically the same as those obtained from whole corn, and would not justify the expense incident to grinding the grain. . . .

"The cost of making a pound of gain was practically twice as much with the stall-fed cattle as with those handled as stockers, but the conclusion should not be drawn from this statement that stall-feeding will never be a profitable practice.

"These facts justify us in recommending farmers to build silos and utilize silage in their winter feeding operations, and it is believed that its extensive use will give a new impetus to animal industries throughout the South."

Pigs followed the cattle and it was noticeable that although the cattle fed cotton-seed meal received approximately 3 lbs. per head per day the health of the pigs following them was not affected in any way.

The growing and fattening of beef cattle in Maryland, present status of the industry and suggestions for its improvement, B. E. Porter (*Maryland Sta. Bul. 121, pp. 79–110, figs. 6*).—Data concerning the extent of the cattle industry in Maryland, the advantages and disadvantages of cattle feeding under local conditions, the relative merits of different systems of feeding, and other general questions are discussed with special reference to Maryland conditions and the possibility and desirability of developing the State cattle industry. In connection with the work information was gathered regarding the rations fed on 8 farms and the data are discussed with reference to feeding standards and suggestions for improvement are made.

According to the author,

"The amount of profit which a man is able to make is dependent upon the man and his ability to master the forces about him. In the cattle business one man does well by handling registered animals; another does better with grades, and still another will do best by feeding and fattening what his neighbor raises. When feeding cattle some men have made as much on stock at a 6 months' feed as others have made in a year's feeding. Such a result is not because of a reserve of capital, but because there had been more business sagacity and more skillful management of the stock and the food given."

Feed required to grow steers, H. J. PATTERSON (*Maryland Sta. Bul. 121, pp. 111–116*).—Some data are recorded and briefly discussed with reference to the amount of feed required for steers from calves to maturity.

Two Aberdeen-Angus calves weaned when 5 days old made, respectively, an average daily gain of 1.18 and 1.36 lbs. per head for 745 days, the first calf requiring 5.83 lbs. grain, 4.78 lbs. hay, and 2.18 lbs. milk per pound of gain and the second 4.92 lbs. grain, 4.19 lbs. hay, and 1.08 lbs. milk. According to the author, the data recorded for the individual months show that 2 to 3 times as much feed is required to "produce a pound of gain during the steers' second as their first year. These figures also show quite conclusively that steers to be profitably grown must be made to gather their own food as much as possible, and thus reduce labor expense to a minimum, and that at best they must be used as a means for converting unmarketable products into a marketable form."

In the case of 3 steers fed for 2 years the total gain ranged from 340 to 480 lbs., while 2 heifers in a like period gained 314 and 320, respectively.

Methods of steer feeding [barn v. open sheds], T. I. MAIRS (*Pennsylvania Sta. Rpt. 1906, pp. 145–150*).—When barns *v.* open sheds were compared with 2 lots of 12 steers each for 20 weeks, the average gain of the barn-fed lot was 261 lbs. and the lot fed in sheds 271 lbs. per head, the cost of a pound of gain in the 2 lots being respectively 12.02 and 11.65 cts. The barn-fed lot required 9.91 lbs. of corn-and-cob meal and 1.01 lbs. of cotton-seed meal per pound of gain, and the lot fed in sheds 9.51 and 0.97 lb., respectively. In each case the stover eaten per pound of gain was 3.01 lbs. and the hay 2.65 lbs. for the barn-fed lot and 2.83 lbs. for the shed-fed lot.

The general results of the test, according to the author, are similar to those obtained in previous tests (E. S. R., 17, p. 794).

"The two lots of steers ate practically the same amount of feed and made practically the same gains. The temperature of surroundings seems to have very little effect upon the rate of gain. The steers in the barn seemed to gain more uniformly than those outside. Stormy weather with much rain and snow affected adversely the steers in the open shed, and those in the barn to a less extent."

Corn-and-cob meal v. broken ear corn, T. I. MAIRS (*Pennsylvania Sta. Rpt. 1906, pp. 151–154*).—In a study of the comparative value of corn-and-cob meal and broken ear corn a lot of 11 steers was fed such corn in comparison with the barn-fed lot noted above. In 18 weeks the average gain was 219 lbs. per head, as compared with 243 lbs. for the lot fed corn-and-cob meal. Practically the same amounts of hay and grain were eaten per steer in each case. The author computes that for the whole lot there was a difference of $3.41 in the cost of preparation in favor of the broken ear corn, which "was not offset by the increased gains."

Pig feeding with cassava and sweet potatoes, C. M. CONNER (*Florida Sta. Bul. 90, pp. 9*).—In the first of the tests reported cassava and sweet potatoes supplementing like amounts of shorts were compared with 2 lots of 3 pigs in a test covering 2 periods of 28 days each, the rations being reversed at the end of the first period. On sweet potatoes the average daily gain per head was 1.83 lbs. and on cassava 1.24 lbs.

When sweet potatoes and cassava alone and mixed in equal proportions were compared with corn with 4 lots of 4 razor-back pigs fed for 42 days, a gain of 0.357 lb. per head was noted with the corn-fed lot. The other lots lost weight.

the amounts being as follows: On sweet potatoes 0.02 lb., on cassava 0.029 lb., and on sweet potatoes and cassava together 0.003 lb. per head per day. When the test was repeated with 4 lots each containing 4 larger pigs an average daily gain of 1.152 lbs. per head was noted on corn during the 46 days of the feeding period. On sweet potatoes there was a gain of 0.505 lb. per head per day, on cassava 0.233 lb., and on sweet potatoes and cassava together 0.179 lb.

A preliminary test covering 32 days was made to determine whether rape fed with sweet potatoes would add to the palatability of the ration. On such feed 4 pigs made an average daily gain of 0.4 lb. per head per day as compared with 0.9 lb. in the case of a similar lot fed corn and rape. On corn alone the average daily gain was 0.8 lb. per head.

In an additional test 4 pigs fed for 35 days gained 0.142 lb. per head per day on rape and cassava as compared with 0.007 lb. with a similar lot fed cassava alone, and 0.4 lb. in the case of a lot fed cassava with cotton-seed meal. The cotton-seed meal was fed at the rate of 0.5 lb. per head per day and was mixed to a slop and allowed to sour before feeding. The rations of the cassava lot and the cassava and rape lot were then modified by the addition of 0.75 lb. of cotton-seed meal per head per day and the test continued for 35 days longer, with the result that an average daily gain of 1.685 lbs. per head was noted on the ration without rape and 1.892 lbs. on the ration with rape.

"In this test it is rather remarkable that the amount of cassava consumed was only slightly greater and the gain was over one-fourth greater when the rape was fed with it than when fed alone. This was noticeable all through the experiment."

Comparison of four methods of feeding early hatched pullets, J. E. Rice (*New York Cornell Sta. Bul. 249, pp. 229–264, figs. 4, charts 12*).—It is commonly supposed that while early pullets are the most profitable layers those which are hatched very early are not so well adapted for this purpose and that they should receive such treatment during the late summer as would retard egg laying with the hope of securing a larger yield in early winter. This is accomplished by allowing pullets when they approach maturity a grass run and a satisfying ration of whole grain with a limited proportion of beef scrap but no ground grain. It is also thought that if such pullets are forced, that is, fed a stimulating mash to induce egg production they will lay a few small eggs and molt prematurely, thus reducing their vitality, and that the subsequent egg production will be small and their bodies prematurely stunted.

These questions were studied with 4 lots of 20 Single Comb White Leghorn pullets selected for the trial which covered 364 days. All the lots were fed cracked corn, wheat, and oats in varying proportion with some buckwheat during part of the time. The pullets in two of the pens were forced and fed in addition a mash of corn meal, wheat middlings, beef scrap, wheat bran, and alfalfa meal 2:2:2:1:1, the mash being wet for one lot and dry for the other. "The proportion of mash to total food eaten by the forced hens was 31.5 per cent and the average amount of meat eaten in the mash was 7.9 per cent of total food." The retarded lots were given no mash, but 5.2 per cent of their total food was beef scrap fed very nearly ad libitum. One of these lots was hand fed and the other fed the grain from a hopper.

On an average the forced pullets gained in a year 1.19 lbs. per hen and the retarded pullets 0.91 lb. The average egg production per hen in the 2 lots was 125.3 and 109.1 eggs and the cost of the eggs per dozen 11.1 and 13.3 cts., respectively. In the case of the forced pullets 91.9 per cent of the eggs were fertile and of these 78.9 per cent hatched. With retarded pullets 94.1 per cent of the eggs were found to be fertile and of these 68.5 per cent hatched.

The influence of the system of feeding on molting was studied with representative pullets from each lot, the hens being dipped in dyes in order that the feathers shed could be readily gathered and those from each pullet identified. On an average the early-laying forced pullets molted 82.7 days and the late-laying forced pullets 103.1 days. The early-laying retarded pullets molted 97.1 days and the late-laying retarded pullets 89.8 days.

According to the author's summary, the hens fed only whole grain ate 38 per cent more grit than those fed mash in addition and although they laid fewer eggs they consumed 27.9 per cent more oyster shell. On the whole, the forced pullets gave more profit than the retarded pullets, eating less per pullet at a less cost. They also produced more eggs of a larger size at a less cost per dozen than the retarded pullets and produced more eggs during the early winter. The forced pullets showed less broodiness, lower mortality, and better vigor than the retarded pullets and produced eggs of a higher degree of fertility. Forced pullets which matured early also molted earlier than similar retarded pullets.

From the recorded data the author also discusses the comparative value of wet and dry mash for pullets and the value of hand feeding as compared with hopper feeding.

"Hopper-fed dry mash gave better results in gain of weight, production of eggs, gain in weight of eggs, hatching power of eggs, days lost in molting, mortality, health and profit per hen, than wet mash.

"Wet mash and grain fed pullets consumed slightly less food at less cost, and produced eggs at slightly less cost per dozen than dry mash and grain fed pullets.

"Wet mash and grain fed pullets produced slightly larger eggs of slightly better fertility, and showed less broodiness than dry mash and grain fed pullets.

"Dry mash and grain fed pullets laid eggs of good size at an earlier period than wet mash and grain fed pullets.

"Hopper-fed pullets ate more than hand-fed pullets.

"Pullets having whole grain ate more grit and shell than those having a proportion of ground grain.

"Pullets fed on grain were more inclined to develop bad habits than those having a mash.

"Earliest producers did not give as many eggs in early winter.

"Early layers gained as rapidly in weight as those beginning later to lay. Prolificacy made but slight difference in weight of hen and weight of egg. The most prolific pullets did not always lay earliest. Pullets did not as a rule lay while molting."

The hen's place on the farm. O. Erf (*Kansas Sta. Bul. 150, pp. 15–78, figs. 17*).—On the basis of data gathered from Kansas poultry feeders and the experience of the Kansas Station, breeds, feeding, care and management, housing and appliances, trap nests, marketing, poultry diseases, and related questions are discussed with special reference to Kansas conditions.

According to information gathered regarding breeds on Kansas farms, Barred Plymouth Rocks were the most popular being found on 113 farms, with Brown Leghorns next in order on 30 farms, Black Langshans on 24 farms, White Leghorns and mongrels each on 17 farms, and other breeds in smaller proportion. Barred Plymouth Rocks were found to be ranked first by packers, and Brahmas and Cochins were considered among the best as capons.

As regards incubators, replies received from 111 Kansas farmers report that 21 have tried them and that 6 have found incubators an improvement over hatching with hens, 10 considered the incubator as being successful but no better than hens, and the remainder found them unsatisfactory.

In crate feeding a ration used by some Kansas feeders with great success, according to the author, is composed of oatmeal and buttermilk in the form of a soft batter which is left in the troughs for about 30 minutes and the residue then removed. "Chickens are generally fed 3 times per day. Water may or may not be given, according to the weather and the amount of liquid used in the food."

In the case of a 12 months' feeding test with 6 pens of White Leghorns carried on at the college farm the average egg yield varied from 64.5 eggs per hen on a ration of wheat and corn to 125 eggs per hen on a ration of casein, corn chop, wheat, and corn, and the profit per hen from 15.7 cts. on wheat and corn to 63 cts. on the casein ration mentioned.

In general the author concludes that "the Kansas farmer, or the farmer in general, has not yet fully recognized the full value of poultry on the farm for supplying food for his table. Besides the eggs that they produce, which are being recognized as one of the most wholesome food products that we have, the poultry should furnish to the farmer the bulk of his meat for the year, which can be had at all times in a fresh and healthy condition. There is no other meat that can be produced as cheaply and is as wholesome."

DAIRY FARMING—DAIRYING—AGROTECHNY.

Preliminary observations on protein supply of dairy herd, T. I. MAIRS (*Pennsylvania Sta. Rpt. 1906, pp. 127–138*).—Observations undertaken, as explained in a previous report (E. S. R., 18, p. 472), were continued during the year 1905–6, and records of the 16 cows in each of the two lots into which the herd was divided are reported. From these results the following deductions are drawn:

The cows fed the larger amount of protein produced more milk than those fed the smaller amount, but the cost of milk per 100 lbs. was more for the former than for the latter. The amount of protein in the feed had no perceptible effect upon the composition of the milk and the chief advantage of the larger amount, if any, seemed to be in stimulating the appetite, which induced the cows to eat more and possibly resulted in the greater milk production.

"While the results of these observations do not warrant any radical conclusions, it is thought that they are sufficient to indicate that beyond certain limits the supply of protein is of much less importance than was formerly considered, and that an excess of protein beyond that required for maintenance and for the protein of the milk does not stimulate a greatly increased production."

Continued experiments as to the albuminoid minimum in the rations of dairy cows (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *63* (*1907*), *pp. 110+48*).—Experiments with 6 cows were conducted from October 15, 1906, to February 1, 1907, in continuation of investigations previously reported (E. S. R., 18, p. 668). The balance of both albuminoid and amid nitrogen was determined for each cow in two series of tests, one with ample rations containing much amid nitrogen but too little total nitrogen, and the other with rations containing as little amid nitrogen as possible. Conclusions drawn by the author from the results of the experiments may be briefly stated as follows:

Cows on a ration containing enough nonnitrogenous constituents for all functions not requiring albuminoid nitrogen, but furnishing less albuminoid nitrogen than is accounted for in excreta and milk, are below the actual albuminoid minimum and supply the deficit from their own bodies. This can not be prevented by excess of amids, for the amids in the feed can not be metabolized to albuminoids. The nitric nitrogen supplied to cows in roots escapes in gaseous form through bacterial activity in the intestines. In the opinion of the authors cows require only a very little nitrogen to replace broken-down body tissue. The results of these experiments do not show definitely how much, but the amount may be not more than a few grams per day. Cows do, however, require what is called intestinal nitrogen and kidney nitrogen. The former is albuminoid nitrogen derived from digestive fluids, mucus from intestinal walls, etc., and is excreted in the feces. Its amount is determined partly by the amount of feed eaten, partly by its nitrogen content, and may be estimated at about 2½ gm. daily per "feed unit." The amid nitrogen found in the feces comes from the feed. The kidney nitrogen is that required for the activities of the kidneys. It may be amid nitrogen, but if there is not enough of this present, albuminoid nitrogen will be used to supply the required amount.

Artificial digestion of feces with pepsin-HCl indicated that the albuminoid nitrogen and the amid nitrogen of the ration were digested in about equal proportions when the feed contained a relatively large amount of nitrogen, but if the amount was relatively small the amid nitrogen was digested in the larger proportion. The authors point out the value of determination of albuminoid nitrogen of the ration by the Stutzer method, and recommend that this determination be added to the analyses generally made.

Calorimetric determinations showed that the energy of the feces was about 33 per cent of that of the feed, indicating that about 67 per cent was apparently digested; but since about one-fourth of the heat value of the feces was derived from the metabolic products, about 75 per cent of the energy of the feed was actually utilized. The heat value of the urine was always very low, only about 2 per cent of that of the feed. The portion of the food energy accounted for by the energy of the milk varied according to the milk yield, reaching a maximum of 20 to 25 per cent in the case of fresh cows.

Investigations on the indispensable minimum of albuminoid nitrogenous substances in the ration of milch cows, A. MALLÈVRE (*Soc. Aliment. Rationn. Bétail, Compte Rendu 11. Cong., 1907, pp. 47-124, dgms. 4*).—This article is a translation into French of the major portion of a publication previously noted (E. S. R., 18, p. 668) and referred to above.

Some considerations of the nitrogenous nutrition of milch cows, A. MALLÈVRE (*Soc. Aliment. Rationn. Bétail, Compte Rendu 11. Cong., 1907, pp. 29-46*).—The results of the investigations referred to in the previous abstract are considered in detail and their significance discussed. It is pointed out that the results obtained agree with those found by other investigators, the total nitrogenous intake and output of several cows as determined for a number of months on rations of usual and small quantities of nitrogen apparently indicating that the protein requirement of milch cows is lower than is commonly believed, and also that either directly or indirectly the nonalbuminoid nitrogenous substances play some important rôle in the nutrition of animals. In the author's opinion, however, these facts need further study and corroboration before they should be finally accepted as indicating principles to be observed in the feeding of milch cows.

Forage and soiling experiments, 1905, G. C. WATSON and T. I. MAIRS (*Pennsylvania Sta. Rpt. 1906, pp. 111-116*).—The feeding of soiling crops was carried on in continuation of preceding work along the same line (E. S. R., 17, p. 901), but certain crops which had been fed in former years were omitted during the present period as not being worthy of further trial.

The crops fed in the tests here reported were rye, oats and peas, alfalfa, cowpeas, corn, red clover, and sorghum. A mixture of Kafir corn and cowpeas produced the largest yield of green substance per acre, was relished by the cows, and was entirely satisfactory from the standpoint of milk production. Alfalfa produced the largest yield of air-dry substance per acre, and the cows seemed to hold up better in milk production when on alfalfa than on any other crops tested. Oats and peas proved satisfactory as a soiling crop. Rye produced the earliest soiling crop and gave a large yield of dry substance per acre, but under average conditions it ripens too quickly to be most satisfactory. The different forage crops tested seemed to have little, if any, effect upon the composition of the milk.

Studies in milk and butter production, A. M. Soule, J. R. Fain and M. P. Jarnagin (*Virginia Sta. Bul. 170, pp. 44, figs. 8*).—The method of maintaining herd records is described in considerable detail, with illustrations of the sheets on which are kept the records of the quantities of feeds eaten and wasted, the quantities of milk produced, and other items necessary for the complete accounting of the individual cows. From the data thus gathered records of the cows comprising a Holstein herd, a Jersey herd, a Guernsey herd, and a grade herd are presented by monthly averages for the years 1905 and 1906. Individual records of a considerable number of cows in each herd are also given.

"In profit on milk the Holsteins led with $9.42 per individual per month, the grades were second with $7.27, the Jerseys were third with $6.97, and the Guernseys were fourth with $5.58. In profit on butter the Jerseys led with $2.73, the Guernseys were second with $2.63, the Holsteins were third with $2.23, and the grades were fourth with $2.21." The Holstein cow with the best individual record continued milking for 21 months, giving 12,498.4 lbs. of milk and 524.24 lbs. of butter. The profit on milk at 20 cts. a gallon was $201.05 and on butter at 25 cts. a pound $41.51. In the average of 31 lactation periods with Holstein cows each individual consumed 2,631.5 lbs. of digestible matter. The cost of the food was $40.26, the production of milk was 6,650.8 lbs., and of butter 264.4 lbs. The profit on milk was $114.41 and on butter $25.84. The Jersey cow with the best record produced 7,115.8 lbs. of milk and 367.5 lbs. of butter in a single lactation period. The profit on milk was $135.79 and on butter $62.24. The Guernsey cow with the best record produced 7,117.4 lbs. of milk and 402.1 lbs. of butter in a single lactation period. The profit on milk was $98.92 and on butter $36.27. The grade cow with the best record produced 5,308.6 lbs. of milk and 240.1 lbs. of butter in a single lactation period. The profit on milk was $96.43 and on butter $33.02.

In connection with the discussion of the performance of individual cows, the records are given of a Holstein-Friesian cow for 2 lactation periods, of 4 of her daughters during 8 lactation periods, of 6 of her granddaughters during 8 lactation periods, and of 2 of her great-granddaughters during 2 lactation periods. In no instance was the average production per lactation period for any of these groups less than 5,236.2 lbs. of milk and 215.8 lbs. of butter, and in most instances it was much higher.

In the author's opinion the results show "that where milk is the greatest desideratum, the Holsteins will be a strong favorite; for butter making, the Jerseys and Guernseys should have the preference, but for general purpose work the grade herd will be found very satisfactory." "The record of the grade herd shows quite clearly that [a profitable] one can be established in a comparatively short time, provided cows of good average production are selected and mated with the right type of sire. The record shows that grade animals are often as profitable as the more costly pure-breds, and that for the average farmer the grade is probably the most satisfactory animal, as the establishment and maintenance of the herd will not be such a costly undertaking, while the results from the standpoint of profit will be practically the same."

Report of the composition of milk from herds competing for advanced registration, M. H. PINGREE (*Pennsylvania Sta. Rpt. 1906, pp. 54–93, charts 3*).—Official examination of about 1,500 milk samples, representing the product of 128 cows from 11 herds, was made in cooperation with the Dairy Breeders' Association in connection with the advanced registration of dairy cows. Records of 18 Guernsey cows and of 24 Ayrshire cows are reported in detail. Those of the Guernsey breed are discussed with respect to changes of composition during the lactation period and to the influence of change from barn feeding to pasturage upon the composition of the milk, and those of both breeds with respect to the relative variability in composition of milks from a breed yielding very rich milk as compared with those from a breed yielding milk of moderate richness. The following conclusions were drawn from the study:

"*Changes during advance of lactation period.*—The percentages of butter fat showed on the average a tendency to increase throughout the entire lactation period, but the increase was most marked during the first five months and last month.

"*Effect of changes from barn to pasture.*—The percentage of solids-not-fat decreased somewhat as the lactation period advanced. In the majority of cases studied both the percentages of fat and the solids-not-fat, but particularly the latter, suffered a slight depression immediately following the change of the animals from barn to pasture, but tended to increase thereafter under the influence of advancing lactation. The average fat results, however, were somewhat higher for the pasture months than for the barn period, due probably to a disproportionately large number of the cows being in an advanced stage of lactation during the summer months.

"*Relative variability of Guernsey and Ayrshire milks.*—The range of variation in the percentages of fat for both the Guernsey and Ayrshire breeds was about 39 per cent of the respective fat averages, which were 5.13 per cent for the Guernseys and 4.09 per cent for the Ayrshires."

Rules relative to testing dairy cows (*Massachusetts Sta. Circ. 9, pp. 6*).—A statement regarding the conditions under which the station cooperates with the various breeders' associations in official tests of pure-bred cows, the duties of the supervisor, the testing of samples, additional rules with the churn test, special rules of the different associations, yield of milk and butter fat required for advanced registry, and apparatus required and furnished.

The significance of leucocytes and streptococci in the production of a high-grade milk, M. E. PENNINGTON and E. L. ROBERTS (*Jour. Infect. Diseases, 5 (1908), No. 1, pp. 72–84*).—The authors discuss in considerable detail the results obtained in examinations of milk, with special regard to pus cells and streptococci, from a herd of about 70 cows which is being maintained for the commercial production of a high-grade milk, and the relation of the findings to the physical condition of the cows. Their deductions from the investigations follow:

"A correlation of the finding of streptococci or of many leucocytes in milk by the laboratory, with the physical condition of the cows in a herd maintained for the production of a very clean milk, would seem to show that in many cases there is a connection between such findings and the condition of the cow, both in relation to specific udder and to systemic affections. Such parallelism seems to obtain for the end of the lactation period, for the beginning of an udder inflammation, for an attack of cowpox, and, possibly, for chemotactic conditions due to high feeding of animals constitutionally unable to transform the increased feed into increased milk.

"The frequent laboratory examination of the milk of individual cows has materially assisted the herdsman in preserving the good health of the animals and has stimulated more frequent and careful clinical observations.

"It is believed, too, that such examinations are a very material factor in maintaining a bacterial count which, for the past 13 months, averages 3,267 organisms per cubic centimeter when the milk is from 26 to 40 hours old."

Pure ferments in the manufacture of butter, II. WEIGMANN (*Indus. Lait. [Paris], 33 (1908), No. 2, pp. 18, 19*).—After reviewing the present state of knowledge regarding the influence of bacteria in the manufacture of butter, the author concludes "(1) That pure cultures for butter making should contain lactic ferments of the group *Streptococcus lacticus* of aromatic type; (2) the aroma produced by these pure cultures is not yet equal to that of extra fine butter; and (3) the specific aroma of the latter is produced by the simultaneous action of several bacteria accompanying the lactic ferments. The exact nature of these bacteria is not yet definitely known."

Danish dairy statistics, 1906, J. N. DALL (*Mejeri-Drifts-Statistik. Odense, 1907, pp. 196*).—This is the tenth annual report of the Bureau of Dairy Statistics, published with government aid. The accounts of 570 different creameries are given in detail, and the average results presented in tables and graphically. The average annual milk yield per cow reported was 4,714 Danish pounds (about 5,185 lbs. avoirdupois); 25.6 lbs. milk were required per pound of butter; the average price of butter was 99.9 öre (27 cts.); the running expenses per 1,000 lbs. milk were 264 öre (71 cts.); and the net proceeds per 1,000 lbs. milk were 3,647 öre ($9.86).

Danish butter exports, 1906–7, B. BÖGGILD (*Tidsskr. Landokonom., 1907, No. 13, pp. 673–685*).—This is the usual annual account published by the author, giving statistics and discussions of the general conditions of the industry during the year.

Report of Finnish butter exhibitions, 1905, A. ANDELIN and G. A. BREDENBERG (*Landtbr. Styr. Meddel. 54, 1907, pp. 28*).—In addition to the usual account of the results of the butter exhibitions held during the year, which included 1,059 different tubs of butter from 221 creameries, discussions are included on the following subjects: On combined churn and butter workers, some butter diseases and their true causes, the refractive index of butter fat and its content of volatile acids, and on the transportation of export butter.

On the operations of the Danish pasteurization law, 1906–7 (*Mälkeritid, 20 (1907), No. 47, pp. 957–987*).—During the year 1,140 cooperative and 138 proprietary creameries and 62 private estate dairies were under legal control. The police authorities collected 7,176 samples of skim milk and 7,178 samples of buttermilk and cream for examination. As shown by the Storch test, 3.2 per cent of the former and 2.5 per cent of the latter samples were pasteurized at too low temperature. The number of fines imposed was 392, amounting to an aggregate of 5,002 kroner ($1,350).

Pasteurized milk for cheese making by the Johan-Olsen yeast method, H. P. LUNDE and E. HOLM (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsøg [Copenhagen], 61 (1907), pp. 47+37*).—At three factories 214 trials were made, one-half with pasteurized milk and the other with nonpasteurized milk of the same origin, separator skim milk, alone and mixed with either 25 to 30 per cent or 50 to 60 per cent whole milk, being used. The cultures of yeast were prepared in the same manner as ordinary pure cultures from centrifugal skim milk heated to 80 to 85° for 2 hours, then cooled to 33° with 2 per cent of the yeast added during stirring and kept for 18 hours at 33° before being used. Twice the normal quantity of rennet was required to coagulate the pasteurized milk in normal time. The same method of manufacture was otherwise followed, except that the pasteurized milk was heated 3 to 5° higher than normal after addition of the rennet, in order to expel the whey.

The results showed that a good quality of cheese can be made by this method from milk pasteurized at 85°, though not quite equal to that of cheese made from raw milk. The yields obtained from the former were somewhat higher. It was also found possible to make cheese from pasteurized milk with buttermilk or sour milk, but in this case also the quality was somewhat poorer than that made from nonpasteurized milk.

Determinations of the amount of fat in green and in cured cheese by the Bondzynski HCl-method indicated that the absolute quantity of fat in cheese does not increase during the process of curing.

Brynsa, a Russian cheese from sheep's milk, P. G. Mélikoff and Rosenblatt (*Jour. Agr. Prat., n. ser., 14 (1907), No. 52, pp. 814, 815*).—The method of making the cheese is briefly described and the results of the analyses of three samples from different districts are reported. The average in round numbers was water 48, protein 16, fat 27, and mineral matters 7 per cent, the latter including about 5.5 per cent salt. The quantity of lactic acid averaged 1.4 per cent.

Bacteriological analyses of some dried milk preparations, F. Prachfeld (*Ztschr. Fleisch u. Milchhyg., 18 (1908), No. 4, pp. 121–125*).—Tests were made with samples of six kinds of dried milk preparations. The germ content ranged from 4,000 to 69,000 organisms per gram of dry substance. The author identified 25 different species of micro-organisms, including bacilli, bacteria, streptococci, micrococci, actinomyces, a yeast, and a mold. The nature of the organisms indicated that they had gained access to the material from the air subsequent to the drying process.

Artificial aging of wine and spirits by ozone, A. Plotti (*Prog. Agr. et Vit. [Ed. l'Est], 28 (1907), No. 49, pp. 677–680*).—Several advantages are claimed for the practice of aging alcoholic beverages by the use of ozone.

[The destruction of bacteria by high pressure], E. W. Duckwall (*Canner and Dried Fruit Packer, 25 (1908), No. 25, pp. 21–25, figs. 4*).—According to the author, very encouraging results have been obtained in investigations on the effect of very high pressures in destroying bacteria during the process of canning fruits and vegetables. The bacteriological work is being done at the National Canners' Laboratory, which is cooperating with one of the experiment stations in the investigations.

VETERINARY MEDICINE.

Report on the veterinary service of Saxony, 1906 (*Ber. Veterinärw. Königr. Sachsen, 51 (1907), pp. VI+228*).—In the present report an account is given of the veterinary service in connection with a study of animal diseases, meat inspection, and related subjects. The account of veterinary education previously combined with this report will be published separately. As in previous reports detailed statistical notes are given on the prevalence and peculiar features of the more important animal diseases observed in Saxony, the breeding of animals, meat inspection, and animal insurance.

Report of the veterinary surgeon to the corporation of the city of Glasgow, A. M. Trotter (*Rpt. Vet. Surg. Glasgow, 1906, pp. 29*).—Attention is called to the unsatisfactory inspection of pork imported into Glasgow from other parts of Scotland and from Ireland, and recommendations are made as to methods by which this inspection may be made more effective. Statistical data are also given on the occurrence of tuberculosis, anthrax, glanders, inspection of milch cows, and milk supervision.

Particular attention is called to the almost unqualified success which has followed the system of cooperative pork-slaughtering and bacon-curing establishments in Denmark. These systems are strictly cooperative but the funds for establishing the plants were originally furnished by Danish banks. The cooperative system is believed to be applicable to the conditions which prevail in Great Britain.

Report of the cattle commissioners, I. A. WATSON, N. J. BACHELDER, and H. O. HADLEY (*Rpt. Bd. Agr. [N. H.], 29 (1905-6), pp. 238-283*).—During the period under report an increased effort has been made to disinfect premises where diseased animals have been destroyed. It is believed that the good effects of disinfection and other sanitary measures are of more importance in the ultimate eradication of infectious diseases than has usually been supposed.

The causes of trypanolytic crises and recurrence of trypanosome diseases, A. MASSAGLIA (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 17, pp. 687-689*).—The experiments reported in this paper were carried out on guinea pigs infected with surra. The crises in the destruction of trypanosomes are believed to be due to the formation of antibodies in the blood of infected animals. A number of the blood parasites, however, acquire a tolerance to the antibodies and therefore persist. These surviving parasites may bring about a recurrence of the disease.

The vitality of trypanosomes in dead bodies, W. L. JAKIMOFF and NINA KOLL (*Arch. Sci. Biol. [St. Petersb.], 12 (1907), No. 4-5, pp. 351-358*).—The experiments reported in this paper related to a study of the organisms of nagana, mal de caderas, surra, and dourine. The vitality of these trypanosomes was studied in dead bodies of white mice kept at low and relatively high temperatures. It was found that the organism of surra retained its vitality longer than the other trypanosomes both at the low and high temperatures, remaining virulent in the bodies of white mice kept at a temperature of 30.5° C. for a period of 15 hours.

The causes of phagocytosis, F. NEUFELD (*Arb. K. Gsndhtsamt., 27 (1907), No. 2, pp. 414-424*).—In cases of bacterial infection where phagocytosis occurs this condition may be explained by assuming either that the phagocytosis is of normal occurrence or that it takes place only in the presence and under the stimulus of certain substances which affect the phagocytes. In the author's study of phagocytosis as observed in various diseases considerable evidence was obtained to support the belief in opsonins or other substances which stimulate the phagocytes and reduce the resisting power of pathogenic bacteria.

The influence of tuberculin on phagocytosis of the tubercle bacillus, A. CALMETTE, M. BRETON, and G. PETIT (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 29, pp. 324-326*).—In experiments with guinea pigs it was found that the use of tuberculin in small single doses or in small doses repeated at regular intervals and administered in the peritoneum or under the skin strikingly increases the phagocytic power of the leucocytes toward the tubercle bacillus. On the other hand the single or repeated injection of large doses of tuberculin reduces this power.

Ophthalmic and cutaneous reaction in experimental tuberculosis of rabbits, P. NOBÉCOURT and C. MANTOUX (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 30, pp. 382-384*).—In testing these methods on rabbits it was found that the cuti-reaction was constantly negative and that the ophthalmo-reaction occurred only irregularly. It did not appear until after 19 hours and was only slight and of short duration.

The action of tubercle bacilli upon the uninjured skin, C. FRAENKEL (*Hyg. Rundschau, 17 (1907), No. 15, pp. 903-906*).—A small area of the skin of 22 guinea pigs was carefully shaved and the animals were kept under observation for 24 hours afterward to determine beyond question that no injury had been done to the skin. Tubercle bacilli which had been grown on glycerin blood serum were then rubbed on these shaved areas and the animals kept for further observation. In all except one case a fatal general infection of tuberculosis took place within from 2½ to 10 months, although in no case was there any observable change in the skin. It appears, therefore, that the tubercle bacillus at least in the case of the guinea pig is capable of penetrating the uninjured skin.

The present status of knowledge of tuberculosis, LYDIA RABINOWITSCH (*Tuberculosis, 6 (1907), No. 8, pp. 378-385*).—In the opinion of the author there is little difference in the infectiousness for man of tubercle bacilli of different origin. The question whether infection takes place from bovine or human sources depends largely on the opportunity which is offered for infection from these sources, and this in turn depends upon the mode of life of the individual and a number of other chance factors.

Tuberculosis in Latin America, P. BERGES (*Bol. Min. Agr. [Buenos Ayres], 7 (1907), No. 4-5, pp. 227-256*).—Elaborate statistics are presented regarding the prevalence of tuberculosis among the various domestic animals, particularly cattle, hogs, dogs, and birds, as compared with human tuberculosis in Uruguay, Argentina, Chile, and other countries of South America as well as Central America and Cuba. The author concludes that there is an evident causal connection between the forms of tuberculosis observed in different animals and man.

The occurrence of latent tubercle bacilli in the lymphatic glands of cattle and hogs, E. JOEST, C. NOAK, and C. LIEBRECHT (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1907), No. 3-4, pp. 257-293*).—In recent years considerable interest has attached to the question whether virulent tubercle bacilli may be found in apparently unaltered lymphatic glands of food animals, and the question was studied in connection with immunizing experiments.

The authors soon came to the conclusion that from a histological standpoint there is no latent tuberculosis. During the experiments 141 lymphatic glands from cattle, hogs, and goats affected with generalized tuberculosis were used for inoculation experiments, and in these experiments it appeared that the tubercle bacilli which are present in the lymphatic glands are found only in tuberculous foci and not in nontuberculous tissue and that, therefore, the lymphatic glands did not contain latent tubercle bacilli. The extent to which apparently unaffected lymphatic glands may be infected with tubercle bacilli varies considerably in individual cases, but has occurred frequently enough, however, to suggest the desirability of greater precautions in inspecting the meat from such animals.

Pathological alterations of the suprarenal capsules in rabies, A. E. SÉLINOFF (*Arch. Sci. Biol. [St. Petersb.], 13 (1907), No. 1, pp. 88-93, pl. 1*).—After death from rabies the suprarenal capsules in rabbits and dogs show few or no general alterations which are apparent to the naked eye. Upon examining sections under the microscope, however, either progressive or retrogressive changes are noted in the case of rabbits. Quite frequently the number of cells is greatly increased and an unusual rate of cell division is noted. In the suprarenal capsules of dogs, more frequently than in rabbits, small nodules are observed which are composed of minute white globules.

Observations on rabies in cattle, J. NESSL (*Tierärztl. Zentbl., 30 (1907), No. 22, pp. 359-364*).—Four cases of rabies were observed in a herd of cattle in which the pathological lesions were somewhat different from those which have usually been described. The mucous membranes were somewhat bluish and a yellowish bloody infiltrate collected in the thoracic cavity. The blood in the large vessels was unusually black. The pharyngeal lymphatic glands also exhibited a blackish red color.

Chronic milk fever, T. Nissen (*Norsk Vet. Tidsskr., 19 (1907), No. 10–11, pp. 244–249*).—A short account of the symptoms of milk fever with notes on the occurrence of this disease without immediate connection with parturition. A detailed clinical statement is given of a case of chronic milk fever which persisted for 4 months and was at first treated as a case of malnutrition. Finally pronounced symptoms of milk fever appeared. The usual air treatment for this disease was then given with the result that complete recovery occurred promptly and the chronic symptoms which had persisted for 4 months also disappeared.

Foot-and-mouth disease, L. Granato (*Rev. Agr. [São Paulo], 13 (1907), No. 145, pp. 379–391*).—The symptoms, etiology, distribution, and therapy of this disease are briefly discussed. In disinfecting after its occurrence sulphate of copper or creolin is recommended.

The connection between the weather, the mineral content of feeding stuffs, and osteomalacia of cattle, M. Lewitt (*Mitt. Landw. Inst. Leipzig, 1907, No. 8, pp. 69–112*).—During the year 1904 the weather was unusually dry and simultaneously a large number of cases of osteomalacia in farm animals were observed.

The conditions surrounding this outbreak of osteomalacia were carefully studied by the author, particular attention being given to chemical analysis of all the ordinary feeding stuffs used in localities where the disease occurred. Forage plants produced during the dry season of 1904 as compared with those which occurred during the wet season of 1902 contained less phosphoric acid and more lime. It is improbable, therefore, that the osteomalacia which occurred in the winter of 1904–5 was due to the lack of lime in the feeding stuffs harvested during the previous growing season. In the opinion of the author the rations as a whole, containing as they did material left over from a previous year and imported from outside sources, were defective in lime and led to a softening of the bone tissue.

Bacteriological study of chronic pneumoniæ of cattle, E. Berger (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1907), No. 3–4, pp. 356–381*).—The pathogenic organisms found by the author in cases of lobular pneumonia of cattle were identical in most of their characters with the micro-organisms observed in human pneumonia. *Bacillus pyogenes* is frequently found in association with the pathogenic organism of pneumonia. It is capable of causing suppurative and metastatic broncho-pneumonia in cattle similar to that which has been observed in hogs and which at times has been mistaken for tuberculosis.

The danger from feeding hay that contains ergot, J. H. McNeil and L. H. Pammel (*Iowa Sta. Press Bul., Jan., pp. 8, figs. 21*).—Cattle are most commonly affected with ergotism but the trouble may occur with other domestic animals including poultry. During the past year an unusual amount of ergotism was observed in Iowa, particularly where large amounts of hay were used containing wild grass. Such hay is not always dangerous even when infested with ergot, but should always be fed with caution. The nature of ergot is briefly described and notes are given on the symptoms of ergotism. In the nervous form of ergotism there is a contraction of the blood vessels which results in dullness and depression. In the gangrenous form of the disease the contraction of the blood vessels may be so pronounced as to cause death andsloughing of tissue about the ankles of affected animals. Ergotism may sometimes be mistaken for foul foot or mycotic stomatitis.

In cases where the tissue sloughs off the affected part may be treated with antiseptics. Internal treatment should consist in the use of tannic acid, Epsom salts, and iodid of potash.

The poisonous nature of Baccharis cordifolia for sheep, A. ANDRIEU (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 3 (1907), No. 4–6, pp. 118–131*).—The poisonous principle of this plant appears to be baccharina and exercises a toxic effect when administered by way of the mouth or hypodermically. Brief notes are given on the symptoms of poisoning.

Braxy, G. HILBRAND (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1907), No. 3–4, pp. 325–348*).—Clinical notes are given on a number of cases of this disease. The experiments and observations of the author indicate that its course may vary from 2 or 3 hours to 2 days. Infection is usually carried with the food. The mortality varies from 5 to 25 per cent. No satisfactory protective inoculation has thus far been devised.

Lip and leg ulceration of sheep, M. E. KNOWLES (*Breeder's Gaz., 52 (1907), No. 19, pp. 936–938, figs. 4*).—This disease is most prevalent in Montana during midwinter and sheep of all ages are susceptible. In cases in which the legs are affected lameness appears very promptly. The disease is due to *Bacillus necrophorus*. Apparently transmission of the disease does not take place except in slight scratches or abrasions of the skin.

A new louse from the sheep, W. EVANS (*Ann. Scot. Nat. Hist., 1907, No. 64, pp. 225, 226, fig. 1*).—A new species of louse referred to as *Hæmatopinus ovillus* is reported as occurring on the face of sheep in Scotland. The parasite is briefly described.

Tuberculosis in swine, J. H. M'NEILL (*Iowa Yearbook Agr. 1906, pt. 6, pp. 227–235*).—Attention is called to the increasing importance of tuberculosis in pigs as shown by the mortality on farms, and particularly by meat inspection at abattoirs. An account is also given of hog cholera.

Further experiments concerning the production of immunity from hog cholera, M. DORSET, C. N. MCBRYDE, and W. B. NILES (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 102, pp. 96*).—Previous investigations by the authors have shown that hog cholera in the United States is caused by filterable and probably ultramicroscopic virus found in the blood, and that the hog-cholera bacillus probably plays the rôle of a secondary organism. This bacillus may invade the hog after infection with the filterable virus and may have some influence on the final outcome of the disease. It is possible, therefore, that a vaccine which will protect the hog against the action of hog cholera will assist to some extent in the control of the disease. It is urged, however, that all efforts looking toward the prevention of hog cholera should be directed primarily towards securing protection against the filterable virus.

The greater part of the bulletin is occupied with detailed accounts of experiments carried out during the years 1903 to 1906. In these experiments tests were made of serum obtained from the hyperimmunized hogs, from nonhyperimmunized immunes, and from other sources.

During experiments conducted in 1905 and 1906, 13 immune hogs were used for the production of serum, and all of these, with one exception, after hyperimmunization, furnished a serum which in doses of 15 cc. would give protection against hog cholera. Simultaneous injection of serum and disease-producing blood was given to 168 hogs, the dose of serum varying from 2.5 to 20 cc. Of these hogs 21 per cent showed symptoms of sickness after injection and 9 per cent died. As contrasted with these hogs, 54 other hogs all became sick and 92.5 per cent died of hog cholera after receiving the same dose of disease-producing blood without the serum. The authors came to the conclusion that hogs immune to hog cholera may be injected with virulent blood so as to develop a serum which will protect susceptible hogs. Hyperimmunization may be accomplished as well by the use of one large dose of virulent blood as by repeated injections of small doses. The serum from naturally immune hogs is as effective as that from artificially immunized animals. This serum in doses of 20 cc. protects susceptible hogs, weighing from 25 to 50 lbs., against a fatal dose of virulent blood. Immunity thus produced persists for 3½ months or perhaps longer. Hogs vaccinated by the serum-simultaneous method do not transmit the disease to other hogs unless they themselves show symptoms of illness. It is possible that the serum may be used as a curative agent in the early stage of the disease.

The determination of the organism of hog cholera by means of a study of complement, A. DEDJULIN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1907), No. 3-4, pp. 313-324*).—The work of this Department and other investigators on hog cholera is briefly reviewed. An extract was obtained from the bone marrow of hogs affected with hog cholera, which was shown to contain a specific receptor which was not identical with that obtained from an extract of *Bacillus suipestifer.* The conclusion is, therefore, reached that the pathological symptoms of hog cholera are not produced by the endotoxins of *B. suipestifer* but by some other organism specifically distinct from this bacillus.

The etiology of German hog cholera, K. GLÄSSER (*Deut. Tierärztl. Wchnschr., 15 (1907), Nos. 44, pp. 617-623; 45, pp. 629-636*).—In the experiments reported by the author it was impossible to produce hog cholera by the use of germ-free filtrates obtained from mixed infection of hog cholera and swine plague, chronic cases of hog cholera, or acute cases of the same disease. Injections of filtrates gave similar negative results in the case of rabbits. On the other hand, when hog-cholera bacilli were fed to rabbits or hogs, typical cases of the disease were produced. The conclusion is reached that in Germany the only cause of hog cholera is *Bacillus suipestifer.*

The etiology and control of German hog cholera, UHLENHUTH (*Berlin. Tierärztl. Wchnschr., 1907, No. 44, pp. 783-790*).—The author has demonstrated that filtered virus obtained from cases of hog cholera produces acute cases of the disease of unusual infectiousness. It is believed, therefore, that this virus contains a living agent which must be considered as the cause of the disease. A series of experiments was carried on for the purpose of obtaining a serum which would have vaccinating power. In this work horses, asses, and hogs were used, but the best results were obtained by the use of an immune serum obtained from hogs. Pigs treated with this immune serum remained in health though exposed continuously for 10 weeks to hogs suffering from hog cholera. Control pigs treated with normal serum and exposed in the same manner all contracted fatal cases of hog cholera within 2 or 3 weeks.

These experiments in immunity were carried out on the basis of the belief that hog cholera is caused by a filterable virus. In the author's opinion the results indicate that *Bacillus suipestifer* is not the cause of the disease.

The bacilli of swine erysipelas in decomposing organs, L. OPALKA (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1907), No. 3-4, pp. 349-353*).—An examination was made of the kidneys, spleen, and skin of mice which had previously been inoculated with this disease. It was found that these organs may contain the bacilli of swine erysipelas in stainable condition. The virulence of the organisms gradually diminishes and the bacilli may be identified by culture on agar and by inoculation experiments.

Do the bacilli of swine erysipelas pass through the normal udder of inoculated cows? O. SCHREIBER and K. NEUMANN (*Ztschr. Fleisch u. Milchhyg., 18 (1907), No. 2, pp. 57, 58*).—Cows are used to a considerable extent in the preparation of a serum for the treatment of swine erysipelas, and the milk of these cows is sold for public use. The question, therefore, arises whether such milk might be infected with the bacillus of swine erysipelas. It was found that in case of disease of the udder such as tuberculosis or mammitis the bacilli of swine erysipelas may pass into the milk. No such occurrence was observed, however, in the case of normal udders.

Milk fever in hogs, J. Wohlmuth (*Tierärztl. Zentbl., 30 (1907), No. 21, pp. 339, 340*).—This disease occasionally occurs in sows soon after parturition, the symptoms resembling those observed in cows. In the author's experience a rapid improvement may be brought about by the administration of calomel and by the manipulation of the udder.

Epizootic lymphangitis, A. Pricolo (*Rev. Gén. Méd. Vét., 10 (1907), No. 117, pp. 457–468*).—This disease, widely distributed in Asia and Africa, is due to *Cryptococcus farciminosus* and affects horses and mules. Its etiology and pathology are discussed at some length.

Immunization against glanders, E. Levy, F. Blumenthal, and A. Marxer (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1907), No. 3–4, pp. 294–312, pls. 2*).—The effect of glycerin in an 80 per cent solution and also of urea upon glanders bacilli was studied. It was found that glanders bacilli soon become attenuated or totally nonvirulent when preserved in an 80 per cent solution of glycerin. In attenuating glanders bacilli urea possesses at least one advantage over glycerin in that the material may be dried in vacuum when the bacilli have reached the desired degree of attenuation.

In a series of experiments carried on by the authors it was found possible to immunize in a considerable percentage of cases both guinea pigs and horses by the use of either dead or greatly attenuated tubercle bacilli. In these experiments it was found that the horse was relatively more susceptible to glanders than the guinea pig, acquiring a fatal infection from the same amount of culture as is required for the guinea pig. In using attenuated bacilli the best results were obtained from small doses. The horses which showed complete immunity to fatal doses of virulent glanders bacilli had been previously treated with dead bacilli.

A study of the local reaction to mallein, A. A. Vladimirov and A. S. Zhirnov (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 6, pp. 475–490*).—A careful study was made of the exudate obtained in the local swelling at the point of inoculation of mallein in testing for glanders. This exudate showed no antitoxic power. Its agglutinating properties proved to be of very low order and very slight precipitating and bactericidal properties were also observed.

The action of mallein on the conjunctiva of the eye, K. Khoromansky (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 9, p. 783*).—In experiments by the author satisfactory reactions were obtained from mallein applied to the eye of suspected horses. This method gives a means of confirming the results obtained by hypodermic inoculation of mallein and the author believes that it may be used independently in cases where hypodermic injections could not be made.

Action of the extract of sclerostomes on the blood of the horse, M. Weinberg (*Ann. Inst. Pasteur, 21 (1907), No. 10, pp. 798–807*).—The extract of *Sclerostomum equinum* possesses the property of dissolving the red blood corpuscles of horses, cattle, sheep, rabbits, and guinea pigs, and it is, therefore, not specific. The hematoxin contained in the extract is secreted largely by the cephalic portion of the parasite and is not destroyed by subjection to a temperature of 115° C. for 15 minutes. The sclerostomes also secrete a substance which acts as a precipitin for the blood serum of horses and of rabbits

The treatment of dourine with atoxyl, Uhlenhuth and Hübener (*Arb. K. Gsndhtsamt., 27 (1907), No. 2, pp. 256–300, pls 4, figs. 6*).—Experiments with horses, dogs, rats, and mice infected with dourine indicate clearly that atoxyl exercises a powerful effect in the destruction of the trypanosomes. By the administration of atoxyl the animal may be protected against the disease and if used during its early stages a recovery may be brought about.

Experiments in the treatment of piroplasmosis of dogs with atoxyl, R. Gonder (*Arb. K. Gsndhtsamt., 27* (*1907*), *No. 2, pp. 301–309*).—Dogs infected with *Babesia canis* were treated with atoxyl in small repeated doses, but it was found that the course of the disease was in no way affected by its use, except that in some cases the symptoms were perhaps more violent than they would have been if the drug had not been used. Evidently dogs are not tolerant to atoxyl and are not benefited by its use in cases of trypanosome infection.

The effect of atoxyl on spirillosis in chickens, Uhlenhuth and Gross (*Arb. K. Gsndhtsamt., 27* (*1907*), *No. 2, pp. 231–255*).—Spirillosis of fowls is due to *Spirochæta gallinarum* which is carried by *Argas miniatus*. The disease appears with a high elevation of temperature and is fatal in a large percentage of cases. In the authors' experiments atoxyl was tested as a curative and preventive remedy. For preventive purposes 0.02 to 0.08 gm. of a 1 or 2 per cent solution of atoxyl was injected into the muscles. An administration of 0.05 gm. of atoxyl was sufficient to cause the disappearance of the spirochætes in the blood within from 20 to 30 hours.

Outside of the body atoxyl appeared to have little or no effect upon the spirochætes. It is believed that the effect in the body is due to a prevention of the multiplication of these organisms. At any rate the use of atoxyl prevents the development of acute symptoms and brings about a crisis in the disease sooner than it would otherwise occur. It, therefore, protects the organism and apparently stimulates phagocytosis.

The etiology of fowl diphtheria and chicken pox, T. Carnwath (*Arb. K. Gsndhtsamt., 27* (*1907*), *No. 2, pp. 388–402, figs. 2*).—In a bacteriological and clinical study of fowls said to be affected with these diseases a number of bacterial organisms were found but none appeared to be a specific cause. Inoculation experiments with material from supposed cases of fowl diphtheria gave negative results.

The symptoms of these two diseases vary to a considerable extent. In the author's opinion, most if not all cases of so-called fowl diphtheria are chicken pox with perhaps an unusual distribution of the lesions.

Disease of turkeys (infectious enterohepatitis), E. F. Pernot (*Oregon Sta. Bul. 95, pp. 8, pl. 1, fig. 1*).—The most important disease of young turkeys observed by the author in Oregon is blackhead or enterohepatitis. Notes are given on outbreaks of this disease and on its etiology and symptoms. Blackhead is transmitted largely through the feces of diseased fowls, and one advanced case of the disease will, therefore, infect the feeding grounds of the other birds.

The most effective way of controlling the disease is by means of isolation and quarantine. The use of a mixture of sulphur, sulphate of iron, and quinin apparently had beneficial effects in treating the fowls, but the main reliance must be placed on isolation of diseased birds and thorough disinfection of the premises.

The embryonic development of Tænia serrata, C. von Janicki (*Ztschr. Wiss. Zool., 87* (*1907*), *No. 4, pp. 685–724, pls. 2, figs. 3*).—The literature relating to the development of *Tænia serrata* and related tapeworms is critically reviewed in connection with a bibliography of the subject. The early embryonic development of *T. serrata* was followed anew by the author and is carefully described.

RURAL ECONOMICS.

Agrarian movements in Italy, Monin (*Bul. Mens. Off. Renseig. Agr. (Paris), 6 (1907), No. 10, pp. 1219, 1220; Illus. Landw. Ztg., 27 (1907), No. 97, p. 837*).—Notes are given on the organizations of farm laborers and share tenants in different provinces of Italy during the past few years and their conflicts with landowners. The agitations of the farm laborers were to compel employing farmers to adopt a different system at threshing time so as to give more work to farm hands, while the metayers or share tenants demanded a reduction or abolition of certain obligations assumed under their system of renting farms.

Agricultural reform in Ireland, D. Volta (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 4 (1907), No. 3, pp. 204–227*).—This is a review of the efforts made by the British government from the beginning of the nineteenth century to 1907 to change the land-tenure system of Ireland for the purpose of improving the economic and social condition of the peasant classes.

The small-holdings competition in Jamaica, W. Cradwick (*West Indian Bul., 8 (1907), No. 3, pp. 267–270; Trop. Agr. Mag. Ceylon Agr. Soc., 30 (1908), No. 2, pp. 158–161*).—This is an account of a plan in operation during the past four years of offering prizes to the peasantry for the best tilled and best kept farms of not more than 20 acres. The benefits of the scheme are a stimulus to greater and much-needed exertion among the peasantry, better facilities for practical instruction in agriculture by the government traveling instructors, and the allaying of suspicion existing between the government and the peasantry.

The agricultural labor problem (*Fühling's Landw. Ztg., 56 (1907), No. 20, pp. 705–709*).—The facts presented in this article are derived from an inaugural dissertation by H. Schrader.

A description is given of the operation of an estate in the neighborhood of Berlin. The number and classes of farm help, their wages, emoluments, and household accommodations, the amount of land and fertilizing and cultivating privileges granted to each class of workers, and the methods of conducting savings banks for the parents and the members of their families are described. The results of the experiment are believed to indicate a practical solution of the farm help problem in Germany.

Concerning the breach of contract by farm help, J. Henningsen (*Illus. Landw. Ztg., 27 (1907), No. 63, pp. 556–558*).—As remedies for the violation of contracts on the part of farm laborers, the author suggests a greater use of improved machinery as a means of lightening labor but not to displace the laborer, and better care and treatment of farm hands. The by-laws of a society whose object is the formation of a pension fund are appended.

Agricultural cooperation in Italy, De Rocquigny (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 8, pp. 727–735*).—Notes are given on the history, objects, and results of representative agricultural cooperative associations in Italy. These are regarded as exclusively economic and are concerned chiefly with the purchase of farm supplies and the furnishing of credit. The "affittanze collettive," or cooperative farms operated by farm hands who do not have steady employment (E. S. R., 19, p. 587) now number about 100. Statistics show a total of 3,313 agricultural cooperative societies in 1907, including 790 for the purchase of supplies, 1,608 mutual credit associations, 870 societies for agricultural production, and 45 for the sale of products.

Agricultural credit and loan banks, W. T. Turner (*West Indian Bul., 8 (1907), No. 3, pp. 250–253*).—An account of cooperative banks in Jamaica, but more particularly of the Christiana People's Cooperative Bank, the only one now in operation. The interest charged on loans to shareholders is 10 per cent per annum, a rate that is regarded as surprisingly low by people who have been accustomed to paying anywhere from 120 to 240 per cent interest. The benefits of such banks to farmers having no security except their crops are pointed out.

Agricultural associations in the department of Constantine, L. ARRIPE and H. PERRUCHOT (*Bul. Off. Gouvt. Gén. Algérie, 1907, No. 23, Sup., pp. 335–368*).—An account is given of the history and development of the chamber of agriculture, the principal agricultural and horticultural societies, mutual credit banks, agricultural associations, insurance societies, and agricultural cooperative organizations in the department of Constantine, Algeria. The cooperative societies numbered 67 with 197,060 members and had a capital on September 30, 1906, of 6,617,703 francs.

Mutual agricultural credit in Algeria in 1907 (*Bul. Off. Gouvt. Gén. Algérie, 14 (1908), No. 6, pp. 83–86; Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), pp. 261–266*).—The district banks on January 1, 1907, numbered 27, with 129 affiliated local mutual credit banks. Loans from State funds amounted to 3,062,300 francs in 1906, the rates of interest charged by the various local banks ranging from 3 to 7 per cent. The advancement of government aid to mutual credit banks is regarded as placing agricultural credit in Algeria on a firm basis.

Farm bookkeeping, H. E. KING (*Transvaal Agr. Jour., 5 (1907), No. 19, pp. 629–646*).—A system of double-entry bookkeeping that can be kept by any farmer is illustrated and discussed.

The computation of the gross receipts of a farm, E. LAUR (*Fühling's Landw. Ztg., 56 (1907), No. 23, pp. 801–813*).—The principles and methods of calculating the gross returns of a farm are described and illustrated.

What the farm means to the South, D. A. WILLEY (*Tradesman, 58 (1907), No. 4, pp. 136, 137*).—The author shows by statistics how agricultural conditions have improved in the South during the past half century, the increase of diversified crop culture, the reduction in size and the increase in number of farms, and maintains that no section of the country offers better opportunities for farm immigrants and the safe investment of capital. Of the total number of farms in the South Atlantic States 350,000 are cultivated by their owners, and 25,000 are rented to tenants paying cash rentals, while the balance are rented to tenants who pay the owners of farms a portion of the year's harvest.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 3, pp. 17–24*).—Notes are given on the condition of crops in the United States and foreign countries, with statistical data on the acreage, yields, values, exports, and prices of the more important agricultural products.

Crop statistics of Nebraska, 1907, J. J. RYDER (*Nebr. Bur. Labor and Indus. Statis. Bul. 12, pp. 60*).—Statistics of the acreage and yields of crops are tabulated and discussed. The value of 10 principal crops of the State in 1907 was $170,479,769, as compared with $159,467,414 in 1906.

[Agricultural statistics of Germany], D. MEYER (*Illus. Landw. Ztg., 27 (1907), Nos. 67, pp. 587–590; 68, pp. 595–598*).—Data of the yields, imports, and exports of the principal crops and of the home and foreign trade in live stock for the 5-year period 1902–1906 are discussed and compared with similar data for the period 1897–1901.

Agricultural statistics of Prussia for 1906, E. BLENCK (*Preuss. Statis., 1906, No. 202, pp. XLIV+65*).—Data regarding the acreage and yields of the most important crops, including hop and wine production, for the year 1906, and on the number, severity, frequency and damage of hailstorms and floods in 1905 are tabulated and discussed.

Land settlement, agriculture, and live stock (*Statis. Yearbook [Natal], 1906, pp. 69–104*).—Detailed statistics for 1906 are reported. The data under agriculture include the number of implements, acreage and yield of crops, labor employed and average wages, and number and size of farms.

The grain production of the world in the year 1907 (*Die Getreideproduktion der Welt im Jahre 1907. Budapest: Min. Agr., 1907, pp. 109*).—The acreage, production, domestic requirements, and imports and exports of wheat, rye, barley, oats, and corn in the different countries of the world are reported. The total production was 3,076,780,000 quintals (338,445,800 tons) as compared with 3,251,620,000 quintals (357,678,200 tons) in 1906.

[Agricultural statistics of New Zealand], J. D. RITCHIE (*New Zeal. Dept. Agr. Ann. Rpt., 15 (1907), pp. XIX–XL+399–451, dgm. 1*).—Statistics of land area and land in occupation and cultivation, and the number of holdings, acreage and yields of crops, number of live stock, exports of agricultural products, etc., for 1907, in comparison with similar data for preceding years, are tabulated and discussed.

Season and crop report of the Central Provinces and Berar for the year 1906–7, C. W. E. MONTGOMERIE (*Dept. Land Rec. and Settl., Cent. Prov., Season and Crop Rpt. 1906–7, pp. 8+27*).—Statistical data on the rainfall, area under cultivation and in the principal crops, yields of crops, retail prices of principal products, extent of irrigation, and number of live stock in each district are reported and discussed. The supply of farm laborers continued scarce during the year owing to the marked development in industrial enterprises.

Ocean freight rates and the conditions affecting them, F. ANDREWS (*U. S. Dept. Agr., Bur. Statis. Bul. 67, pp. 43*).—Statistical data, as bearing upon the exports of the staple farm products of the United States, are reported and discussed. It is shown that there has been a great reduction in ocean freights on such goods during the last 30 years, and the different factors which have contributed in bringing about this reduction are discussed in detail.

AGRICULTURAL EDUCATION.

Status of the training of teachers of home economics in the United States, 1907, ALICE M. OBER, reported by C. F. LANGWORTHY (*Lake Placid Conf. Home Econ. Proc., 9 (1907), pp. 55–77*).—This is a report on courses of study in home economics, entrance requirements, equipment, number of students, development of the work, kind of positions for which teachers are fitted, and the training which these teachers receive in pedagogics and theories of education in normal schools and State agricultural colleges in the United States. A few of the courses are considered somewhat in detail. Lists of institutions reporting courses in home economics and of those which train teachers in home economics are appended.

A country agricultural high school, H. O. SAMPSON (*Cornell Countryman, 5 (1907), No. 3, pp. 81, 82, figs. 2*).—An account of the course of study, laboratory work, and field practicums of the Cecil County Agricultural School, Calvert, Md.

The Royal Agricultural Academy, Bonn-Poppelsdorf, J. HANSEN (*Deut. Landw. Presse, 34 (1907), No. 88, pp. 693, 694, figs. 9*).—An account of the historical development and present organization of the Royal Agricultural Academy at Bonn-Poppelsdorf.

Institutes and special schools in Switzerland for the improvement of the dairy industry, G. FASCETTI (*Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 6 (1907), VI, No. 1, pp. 59–80*).—This article gives an account of the organization and work of the Agricultural Experiment Station, Dairy Experiment Station, and Bacteriological Laboratory at Liebefeld, near Bern, and describes the Swiss schools which afford instruction in dairying with reference to their origin, organization, equipment, and work. These include the dairy schools at Rütti and Moudon, and the Dairy School of the Agricultural Institute at Fribourg (Perolles). A chapter is devoted to city dairies.

A Jewish farm school, W. A. HENRY (*Breeder's Gaz., 52 (1907), No. 21, pp. 1049, 1050, figs. 2*).—A description of the work of the Baron de Hirsch Agricultural and Industrial School at Woodbine, N. J.

Agriculture in the public schools, T. C. ATKESON (*W. Va. School Jour., 35 (1906), Nos. 1, pp. 15, 16; 2, pp. 14–16; 3, pp. 25–27; 4, pp. 27–29*).—An account of the history and extension of the movement for the introduction of agriculture into the public schools.

Agricultural education—a plea for Cuba, J. T. CRAWLEY (*Estac. Cent. Agron. Cuba Circ. 26, pp. 15*).—Information is given concerning agricultural education in the United States and a plea is made for the establishment of an agricultural college in Cuba.

Rural education in South and West Durham: Its suitability to rural needs, T. S. DYMOND (*County Council Durham, Ed. Dept., Mem., 1907, pp. 27*).

The education of the cottage and market gardener in England and Wales, T. S. DYMOND (*Bd. Ed. [London], Ed. Pamphlet 12, pp. 9*).

[Lessons in elementary agriculture] (*Cornell [Univ., State Col. Agr.] Rural School Leaflet, 1 (1907), Nos. 2, pp. 13–24, figs. 8; 3, pp. 33–44, figs. 9; 4, pp. 49–60, figs. 10*).—These numbers contain the following lessons:

No. 2.—No Two Plants are Alike, by L. H. Bailey; The Constituents of Milk, by R. A. Pearson; The Parts of an Egg, by J. E. Rice; and the Pea Family, by G. F. Warren.

No. 3.—The Struggle to Live, by L. H. Bailey; A First Lesson on the Horse, by M. W. Harper; Study of the Roots of Legumes, by G. F. Warren; A Study in Fruits, by C. S. Wilson; and The Babcock Test.

No. 4.—Plants and Animals Become Adapted to the Conditions in which They Live, by L. H. Bailey; The Babcock Test for Butter-fat in Milk, by R. A. Pearson; Egg Types, by J. E. Rice; Plant Food, by G. F. Warren; Answers to Questions on the Horse; and Memory Selections.

Nearly all of the lessons are illustrated.

Lessons in agriculture, W. C. WELBORN (*Texas School Jour., 25 (1907), No. 4, pp. 19–24, figs. 2*).—This is a discussion of the soils of Texas and their origin and formation, followed by data concerning the rainfall and chief products of the State.

The formation of the soil, A. VIVIAN (*Agr. Col. Ext. Bul. [Ohio State Univ.], 3 (1907), No. 4, pp. 4–11, figs. 9*).—A brief elementary treatise suitable for use in public school classes in agriculture.

Experimental study of germination with a lamp chimney, H. N. LOOMIS (*Nature-Study Rev., 3 (1907), No. 7, pp. 200–205, figs. 2*).—A number of germination experiments, in which seeds are placed between a student lamp chimney and an inserted cylinder of blotting paper, are described.

Lessons on plants, U. THOMPSON (*Honolulu: Kamehameha Schools, 1907, pp. 19*).—Brief elementary lessons intended for use in the lower grades of Hawaiian schools.

Forestry in the public schools, H. A. WINKENWERDER (*U. S. Dept. Agr., Forest Serv. Circ. 130, pp. 20*).—This circular was prepared to show how forestry may be correlated with other subjects in the curriculum of the public schools. Outlines are given showing the phases of the subject of forestry which are suitable for correlation respectively with nature study, arithmetic, United States history, civics, physical geography, commercial geography, botany, woodworking and agriculture. An appendix contains references to literature suitable for use in connection with this work.

The nature-study course, E. R. Downing (*Nature-Study Rev., 3 (1907), No. 7, pp. 191–195*).—An argument against the haphazard use of any material that comes to hand for nature-study work. The author contends that only such material should be utilized as appeals to the interest of the child and that the child should be led to observe for a purpose. He believes that the average course in science in high schools and even in colleges frequently fails to reach its highest educational value because it is presented in such manner as to lack dependent continuity with increasing complexity corresponding to the increasing capacity of the student. He appeals therefore for the introduction of some unifying element in nature-study work, for a theme which may be worked out uniformly and still make use of dissimilar objects. The concept of evolution, in his opinion, is one of the best around which to group nature teaching.

Methods in nature study, E. R. Downing (*Nature-Study Rev., 3 (1907), No. 8, pp. 221–227*).—In this discussion nature study is considered rather as a new method in pedagogy than as a new study in the curriculum. Suggestions are given for carrying out the problem method of study mentioned in the previous article. The author believes that the spirit of investigation and appreciation rather than that of information is the prime desideratum in nature study, and that while the lesson plan should "not be too rigidly adhered to, yet elasticity must not degenerate into aimlessness." There should be an intentional widening of the scope of the work and sufficient plan in carrying it out to make it the basis eventually for the solution of problems.

The question of method in nature study, M. F. Guyer (*Nature-Study Rev., 3 (1907), No. 8, pp. 228–235*).—This is an outline and discussion which bases method in the study of animals on the only two occupations which animals pursue voluntarily, (1) to care for themselves and (2) to care for their offspring. The purpose of an animal in caring for itself is said to be to secure food, self-protection, and adjustment to physical surroundings. The writer also suggests that plants may be studied under the same outline.

Home nature-study course, Anna B. Comstock and J. W. Spencer (*Home Nature-Study Course [Cornell Univ., State Col. Agr.], n. ser., 4 (1907–8), No. 2, pp. 23, figs. 14*).—Suggestions are given for the work of third-year pupils as outlined in the Syllabus of Nature Study and Agriculture issued by the New York State Education Department. There are 6 lessons on birds, 2 on goats, 5 on pines, 3 on the Isabella Tiger moth, and 5 on the potato.

Reading course in dairying, H. B. Wood (*Country Gent., 72 (1907), Nos. 2848, p. 817; 2849, p. 839; 2850, p. 863; 2851, p. 887; 2852, p. 911; 2853, pp. 235, 236; 2854, p. 959; 2855, p. 983; 2856, p. 1007; 2859, p. 1079*).—This is a series of articles on the general topic Principles of Practice in Dairying. The subdivisions of this topic are why milk turns sour, why mangers are harmful, how to build a barn, where pasteurizing fails, the Babcock test and its use, the use of starters, the fat percentage, water supply and drainage, and the disposal of sewage.

Organization lists of the agricultural colleges and experiment stations in the United States (*U. S. Dept. Agr., Office Expt. Stas. Bul. 197, pp. 108*).

MISCELLANEOUS.

Twentieth Annual Report of Illinois Station, 1907 (*Illinois Sta. Rpt. 1907, pp. 11*).—This contains a list of station publications, a brief statement concerning the principal lines of station work, and a financial statement for the fiscal year ended June 30, 1907.

Twentieth Annual Report of Indiana Station, 1907 (*Indiana Sta. Rpt. 1907, pp. 56*).—This contains the organization list, a report of the director on the work of the different departments of the station during the year, a list of station publications during the year, notes on changes in the station staff, an enumeration of some of the needs of the station, more or less detailed reports of heads of departments, a list of the bulletins and circulars issued by the station up to January 1, 1908, and a financial statement for the Federal and miscellaneous funds for the fiscal year ended June 30, 1907, and for the State funds for the fiscal year ended September 30, 1907.

Bulletins of the agricultural experiment stations of Massachusetts, 1883–1907 (*Massachusetts Sta. Circ. 8, pp. 13*).—A list of bulletins issued from 1883 to 1907, those available at present being designated.

Nineteenth Annual Report of New York Cornell Station, 1906 (*New York Cornell Sta. Rpt. 1906, pp. XXIV+234*).—This report, which is not intended for general distribution, contains the organization list of the station, a report of the director which includes brief statements by the heads of departments, a financial statement for the fiscal year ended June 30, 1906, and reprints of Bulletins 231–240, which have been previously noted.

Twentieth Annual Report of New York Cornell Station, 1907 (*New York Cornell Sta. Rpt. 1907, pp. XX+264*).—This report, which is not intended for general distribution, contains the organization list of the station, a report of the president of the university, a report of the director which includes brief statements of the main lines of work of the various departments, a financial statement for the fiscal year ended June 30, 1907, and reprints of Bulletins 241–248, which have been previously noted, and of Bulletin 249, which is noted on page 874 of this issue.

Annual Report of Pennsylvania Station, 1906 (*Pennsylvania Sta. Rpt. 1906, pp. 11+242*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1906, a report of the director on the work of the station during the year, and departmental reports, parts of which are abstracted elsewhere in this issue. The report also contains reprints of Bulletins 76, 77, 78, and 80, previously noted, and of an article on Investigations in the Use of the Bomb Calorimeter (E. S. R., 18, p. 972).

Announcements, R. W. THATCHER (*Washington Sta. Popular Bul. 1, pp. 4*).—This, the first of a series of popular bulletins which are to be issued at frequent intervals, briefly explains the object of the series, the work, organization, and personnel of the station, and its attitude toward correspondence.

Experiment Station Work, XLIV (*U. S. Dept. Agr., Farmers' Bul. 316, pp. 32, figs. 4*).—This number contains articles on the following subjects: Distributing manure and fertilizers, winterkilling of peach buds, color of apples, ringing herbaceous plants, potato scab, gas injury to trees, the tuna or prickly pear, cooking cereal foods, silage making, horse-feeding tests, supplements to corn for hogs, tankage for hogs following cattle, and hoppers for poultry feeding.

Farmers' Bulletins Nos. 251–275, with contents and index (*U. S. Dept. Agr., Div. Pubs. [Pamphlets], pp. 8; pp. 23*).—A table of contents and index to these Farmers' Bulletins.

Accessions to the Department Library, October–December, 1907 (*U. S. Dept. Agr., Library Bul. 66, pp. 63*).

Publications of the Office of Public Roads (*U. S. Dept. Agr., Office Pub. Roads Circ. 88, pp. 5*).—Lists of the bulletins and circulars issued by the Office of Public Roads and of the Farmers' Bulletins and Yearbook articles prepared by that Office.

Agricultural progress, W. Saunders (*Separate from Trans. Roy. Soc. Canada, 3. ser., 1 (1907–8), pp. XXIX–XLIV*).—A discussion of the development and progress of agriculture, especially agriculture in Canada during the past 20 years, and of the influence of the Canadian experimental farms in the advancement which has taken place.

Encyclopedia of agriculture, edited by C. E. Green and D. Young (*Edinburgh and London, 1907, vol. 1, pp. XII+582, pls. 16, figs. 52*).—This is the first volume of a general encyclopedia of agriculture, and contains articles on topics arranged alphabetically from Aberdeen-Angus cattle to Drains.

Proceedings of the meeting of the American Breeders' Association, held at Columbus, Ohio, January 15–18, 1907 (*Amer. Breeders' Assoc. Proc., 3 (1907), pp. 305*).—An account of this meeting has been given (E. S. R., 18, p. 693).

NOTES.

California University and Station.—M. E. Jaffa, associate professor of nutrition, has been made professor of nutrition. *California Fruit Grower* states that J. W. Mills, assistant horticulturist at the Southern California Substation at Riverside, has resigned to engage in commercial work, his resignation becoming effective July 1.

Connecticut State Station.—Edwin Hoyt, of the State board of control, died April 17, at the age of 76 years, and has been succeeded by F. H. Stadtmueller of Elmwood. Charles A. Brautlecht has been appointed chemist.

Connecticut College.—A tentative plan to omit the 1908 session of the summer school in order to permit members of the faculty to attend the Graduate School of Agriculture has been given up in view of the strong demand for its continuance, and the school will be held from July 1 to 24.

Kentucky Station.—A new State food and drug law has been enacted by the legislature. The enforcement of the law is intrusted to the station, which has been given an annual appropriation of $30,000 for the purpose.

Missouri University and Station.—Dr. P. F. Trowbridge, associate chemist and assistant professor of agricultural chemistry, has been made chemist to the station and professor of agricultural chemistry in the university, Claude B. Hutchison has been appointed assistant in agronomy.

Cornell University and Station.—An innovation in the college of agriculture designed to afford additional training in public speaking is the establishment of what is known as the annual agricultural stage. As conducted this year, six students delivered competitive orations pertaining to agriculture and student problems. In addition to prizes the winners were given the privilege of addressing the State Experimenters' League and other agricultural organizations at an assembly held during farmers' week.

R. A. Pearson, in charge of the work in dairy industry, has been appointed State commissioner of agriculture, vice Charles A. Wieting, who has resigned to become a member of the new State Fair Commission.

North Dakota College and Station.—An extensive greenhouse for horticultural work and a machine shed are to be erected. J. C. McDowell, professor of agronomy, has resigned to accept a position in connection with the Farm Management Investigations of this Department.

A substation to test dry farming and irrigation methods has been established at Williston, in charge of E. G. Schollander, who has been succeeded as superintendent of demonstration farms by William R. Porter, a graduate of the college. The Reclamation Service has installed a pumping plant near Williston by which water will be pumped by electricity from the Missouri River and used for the irrigation of a tract of about 7,000 acres. Equipment is being assembled and a number of experiments will be instituted this season.

Ohio University.—A 6 weeks' course in agriculture will be offered at the summer session beginning June 22. The subjects taken up will include studies of soils and of plants and animals, and the course is so arranged that all the topics may be taken during the session or separately in different years. The complete course is planned to cover a year's work in high school agriculture, and is intended as a preparation for the teaching of agriculture in the elementary and secondary schools.

South Dakota College and Station.—John S. Cole and Harry G. Skinner, assistants respectively in agronomy and in animal husbandry in the college and station for several years, have resigned, the former to accept a position with this Department in connection with the Dry-Land Agriculture Investigations, and the latter to engage in the State farmers' institute work. Orland E. White has been appointed assistant in botany.

The station has recently undertaken an experiment in dipping cattle for scab in cooperation with the Bureau of Animal Industry of this Department. A former experiment with sheep has been concluded and the results, which it is believed will be of great benefit to sheep men, are soon to be published.

A new substation has been established at Eureka, in McPherson County, where a section of land has been donated for the purpose. About 40 acres will be broken this spring for trials in growing different crops on prairie sod, and to ascertain the practicability of disking legumes and cultivated grasses into the sod. State funds are available for the maintenance of the substation.

Wisconsin University and Station.—A course in agriculture for teachers is announced for the summer session extending from June 22 to July 31 and in charge of W. A. Henry and G. H. Benkendorf. The curriculum will include lectures, field and stable demonstrations, and laboratory work in dairy husbandry.

Plans have been completed for the new animal husbandry building, which will be a fireproof structure of concrete faced with pressed brick with stone trimmings and slate roofing. The dimensions will be 210 by 110 ft., making it one of the largest buildings in the college of agriculture. A special feature will be the horse and cattle judging pavilion, 180 by 68 ft., with a seating capacity of about 2,000. Work is to be begun on the building during the spring.

Dr. A. S. Alexander has been appointed a member of the committee which will arrange a proper representation at the Ninth International Veterinary Congress, which is to meet this year at The Hague.

Wyoming University and Station.—Director Towar has been appointed temporary president of the university.

Graduate School of Agriculture.—The prospectus of the Graduate School of Agriculture, which will open its third session at Cornell University, Ithaca, N. Y., July 6, has recently been issued. The faculty will include a large number of the leading agricultural scientists of the United States and several from Europe and Canada. The registrar is Prof. G. N. Lauman of Cornell University, to whom all inquiries regarding the school should be addressed.

Forestry Notes.—According to a note in *Science*, the Forest Service of this Department is to cooperate with the University of Idaho in a test of the relative value of Idaho commercial timbers, and with the State Laboratory of Natural History at the University of Illinois in a forest survey of that State.

By a recent decision of the Comptroller of the Treasury Department the Forest Service is given jurisdiction of the Loquillo National Forest in Porto Rico. This forest, which is the only national forest in the insular possessions, was established in 1903, and embraces nearly 66,000 acres in the northeastern part of the island. M. Rothkugel, of the Forest Service, has been detailed to make a study of the conditions and outline a plan of management.

In a recent note in *Science* the opportunities for afforestation in Ireland are discussed. It is stated that few inhabited countries have been so extensively deforested. Although 23 per cent of the land is uncultivated, only 1.5 per cent is in timber, and much of this is scrub growth of little value. On the other hand, importations of timber aggregate $5,000,000 per year. Steps are to be taken under the direction of the Irish department of agriculture, through the forest school at Avondale, to bring about the conservation of the remaining forests and the replanting of considerable areas. A popular objection to this procedure has been that forest plantations offer less employment to labor than equal areas of agricultural land. A study of conditions on the estate of Lord Fitzwilliam, which was planted to timber 50 years ago, shows, however, that although the soil selected was unsuitable for agriculture, four times as much labor has been employed as upon the agricultural land, and the forest tract was also more profitable to the owner.

At Oxford University the number of forestry students enrolled in 1907 numbered 57. The forest gardens and experimental plantations have been largely increased, and it is proposed to add a lecture theater, a class room, museum, laboratory, and professor's room, to be ready by the end of the year.

The province of British Columbia has established a system of forest reserves as a means of checking the wasteful exploitation of timber resources and bringing the care and control of timber more effectually under government control than under the previous policy of leasing timber lands for a term of years. All timber lands not already leased are included in the reserves, which aggregate over 150,000,000 acres, a tract substantially equal to the area of the forest reserves in the United States but much less heavily wooded.

Agricultural Education in Ontario.—The April number of the *O. A. C. Review* contains an interesting discussion of problems of the rural schools and agricultural education in the elementary and secondary grades and of some recent experiments in Ontario in agricultural education. In the opinion of one of the inspectors of public schools, the means for improving rural education appear to be vitally connected with the "training of rural teachers under conditions that will develop what may be called the agricultural spirit." He doubts whether this can be accomplished in normal schools or training schools located in towns, but believes that the establishment of rural training schools is an absolute necessity and that a normal training school should be affiliated with the Ontario Agricultural College as has been done in Quebec and several of the States in this country.

The professor of botany at the Ontario Agricultural College in discussing the training of teachers for rural schools follows a similar line of argument. He ascribes the nonsuccess of previous efforts to introduce agriculture into the schools to failure to provide proper preparation for the teacher. The whole system of schools "has unconsciously militated against the children of the country schools securing an education for rural life. They had their studies directed and shaped by the town school influence. The rural teachers received their higher academic training in town or city; their professional training in the graded model school of a town or the more highly specialized normal school located in a city. Everywhere the environment was urban. The teacher came back into the country consciously or unconsciously bringing the town with him. The natural sympathy that might exist between country-born teacher and country-born pupils became in a measure dulled. The teacher came back to lead the country-born into interests apart from farms and farming." He, too, advocates the establishment of a normal department at Guelph, and concludes that "the day is not far distant when the agricultural colleges of this continent will be regularly engaged in the training of teachers."

Reference is made to the new regulations of the education department by which teachers in rural or village schools holding certificates in elementary agriculture from the Ontario Agricultural College receive a special grant of $30 upon completing satisfactory instruction through a school garden, and to plans for a summer school at Guelph to prepare teachers for this certificate. Further plans for the improvement of rural education include the sending of selected teachers from the normal schools to the agricultural college for three months' courses, the inaugurating of short courses for public school inspectors, the encouraging of conventions of rural school trustees at the college, and the instructing of high school science teachers in "the practical sciences relating to agriculture."

President Creelman of the Ontario Agricultural College contributes a paper dealing with the experiment started June 1, 1907, in which six graduates of the college were selected to teach agriculture in six high schools of the province and to serve as agricultural advisers to the farmers in the surrounding country. He had just inspected the work of these instructors and he says that each is: "Busy from early morning until late at night teaching in the school, meeting farmers in the offices down town, writing letters to farmers all over the country, arranging for short courses of instruction at home or at outside points, preparing plans for experimental plats for the coming summer, attending farmers' institute meetings, and in every possible way putting himself in a position to help the country boy and his father to bigger and higher things in his home life and in his life work on the farm." He finds that where there are farm boys in the classes the work is progressing most satisfactorily and believes that the other activities of the instructors will prove to be of immense value to the farmers and to the teachers in the small rural schools.

The series of articles closes with three papers by three of these agricultural instructors who describe the features of their work during the past year and outline some of their plans for the future.

Agricultural Education in Secondary Schools.—A description of the Winona Agricultural Institute at Winona Lake, Ind., by W. C. Palmer, professor of agriculture and agricultural chemistry, is given in a recent number of *Cornell Countryman*. This school started in 1902 as an academy with an agricultural department and a 6-year course of study, but in 1906 it was changed into a purely agricultural school with a 2-year course. The course of study is largely technical and practical, and includes class-room recitations, laboratory and field work, and field trips. It is divided into three departments, viz, (1) agriculture and agricultural chemistry, (2) dairying and animal husbandry, and (3) horticulture and forestry. The school is open to young men who have graduated from the eighth grade, but most of the students at present in the school have had some high school training.

The Winnebago County School of Agriculture was opened November 4, 1907, at Winneconne, Wis., with an enrollment of 30 pupils, which has since increased to 54. During the last week in February, in cooperation with the State college of agriculture, the school held a farmers' course and housekeepers' conference which was attended by 366 students and many visitors. Among the students were representatives from 8 counties in Wisconsin and 1 in Minnesota.

Agricultural Education in Mexico.—Romulo Escobar, one of the founders and until recently director of the agricultural school at Ciudad Jaurez, Chihuahua, Mexico, which was opened in October, 1905, has recently been appointed by President Diaz to direct the agricultural college and experiment station work in the Republic of Mexico, and is at present reorganizing the National School of Agriculture near Mexico City. He plans to inaugurate a modern course of study in the National School of Agriculture and also to establish other schools in the Republic.

Agricultural Work in the British West Indies.—*West Indian Bulletin* (8 (1907), No. 3), contains the following interesting articles on agricultural education in the British West Indies: Agricultural and Scientific Teaching in the Secondary Schools of Jamaica, by Rev. Canon Simms; Agricultural Education at Barbados, by the Bishop of Barbados and the Windward Islands; Agricultural Education in Secondary Schools at Barbados, by Rev. H. A. Dalton; Some Problems of Agricultural Education at Jamaica, by Hon. H. H. Cousins; General Science in Elementary Schools of Jamaica, by E. J. Wortley; Agriculture in Elementary Schools of Jamaica, by Hon. T. Capper; Agricultural Teaching in Elementary Schools of Barbados, by Rev. J. E. Reece; An Agricultural and Industrial Experiment, by Rev. Father Collins; School Gardens as an Educational Medium, by P. W. Murray; and Agricultural Instructors and their Work, by J. Thomas Palache.

Satisfactory results are reported by the director of the public gardens and plantations in Jamaica from the instruction of small land holders by traveling instructors. In this way, and also by the establishment of agricultural banks and prize-holding schemes, the farmers are developing an increased appreciation for improved methods of cultivation.

Agricultural Experiment Stations in Germany.—An illustrated account is given in *Deutsche Landwirtschaftliche Presse* for February 8 of the work and equipment of the Kaiser Wilhelm Institute of Agriculture which was opened at Bromberg in 1906 with Doctor Gerlach as director. The institute is organized into divisions of agricultural chemistry, bacteriology and field crops, farm reclamation, plant diseases, and animal hygiene. The equipment is unusually complete with about 19 acres of land for plat work and 11 large buildings, including a main building with spacious lecture rooms and offices, several laboratory buildings, greenhouses, etc.

In connection with an article commemorating the twenty-fifth anniversary of the founding of the moor-culture societies in Germany recent numbers of *Illustrierte Landwirtschaftliche Zeitung* and *Deutsche Landwirtschaftliche Presse* give illustrated accounts of the history, work, and equipment of the Moor Experiment Station at Bremen.

Experiment Farms in the Gold Coast.—The experimental cotton farm at Labolabo of which a previous note has been given (E. S. R., 17, p. 724) was transferred to the British Cotton Growing Association in June, 1906. An agricultural station was established at Kumasi in March of the same year with K. G. Burbridge in charge. Fifty acres of land have since been cleared, and experiments begun with rubber and fiber plants, cotton, and jute.

Encouragement to Cultivation of Native Plants in Tunis.—An annual appropriation of $97,000 has been placed at the disposal of the Director of Agriculture of Tunis for the improvement and encouragement of the cultivation of native plants. A part of this fund is to be used immediately for the establishment of experiment fields.

Necrology.—Sir John Eliot, for many years (1886–1903) head of the Indian Meteorological Service, died in France March 18, 1908, age 69 years. Sir John made large and important contributions to the meteorology of India, his climatological atlas of India (E. S. R., 18, p. 526) being considered by the distinguished Austrian meteorologist, J. Hann, the most comprehensive statistical and scientific meteorological record in the world. In his studies of air movements on a large scale he also made important contributions to world meteorology and to the practical work of forecasting the weather.

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At the great conference on the conservation of natural resources held at the White House May 13–15, many matters of the highest interest to the friends of agricultural progress in this country were discussed. Forestry, irrigation, and drainage were naturally very prominent, and the attention of the conference and of the public who watched its proceedings was largely engrossed by these subjects. But important as these are among the material interests of this country, they can not compare with the general subject of soil conservation, which lies at the center of these and other interests.

The problems of forestry and irrigation are localized and their solution depends very largely on the action of the State and National governments and of limited groups of men. The problems of the soil are coextensive with the area of our lands, and their solution depends in very large measure on the independent action of millions of men. Drainage is only one factor in soil conservation. The farms of the United States are its most important and fundamental material asset, and its 10,000,000 farmers and their successors are the men who alone can determine whether the fertility of the soil of this country is to be maintained or exhausted.

The tremendous issues involved in the problems of soil conservation were touched upon in the opening address of the President. "The natural resources I have enumerated can be divided into two sharply distinguished classes accordingly as they are or are not capable of renewal. Mines if used must necessarily be exhausted. The minerals do not and can not renew themselves. Therefore in dealing with the coal, the oil, the gas, the iron, the metals generally, all that we can do is to try to see that they are wisely used. The exhaustion is certain to come in time.

"The second class of resources consists of those which can not only be used in such manner as to leave them undiminished for our children, but can actually be improved by wise use. The soil, the forests, the waterways come in this category. In dealing with mineral resources, man is able to improve on nature only by putting the resources to a beneficial use which in the end exhausts them; but in dealing with the soil and its products man can improve on nature by compelling the resources to renew and even reconstruct themselves in such manner as to serve increasingly beneficial uses—while the living waters can be so controlled as to multiply their benefits."

Mr. James J. Hill, in his masterly address on "The Natural Wealth of the Land and its Conservation," dwelt at some length and with great emphasis on the evidences of the increasing exhaustion of our soils under the systems of agriculture thus far practiced. "There are two ways in which the productive power of the earth is lessened: first, by erosion and the sweeping away of the fertile surface into streams and thence to the sea, and second, by exhaustion through wrong methods of cultivation. The former process has gone far. . . . Millions of acres, in places to the extent of one-tenth of the entire arable area, have been so injured that no industry and no care can restore them.

"Far more ruinous, because universal and continuing in its effects, is the process of soil exhaustion. It is creeping over the land from east to west. . . . The richest region of the West is no more exempt than New England or the South. The soil of the West is being reduced in agricultural potency by exactly the same processes which have driven the farmer of the East, with all his advantage of nearness to markets, from the field.

"The average yield of corn per acre in 1906 was less than it was in 1872. We are barely keeping the acre product stationary. The average wheat crop of the country now ranges from 12½ in ordinary years to 15 bushels per acre in the best seasons. And so it is on down the line."

He also pointed out the overshadowing importance of the conservation of the soil. "I have dwelt upon the conservation of farm resources because of the commanding importance of this industry and because of its relation to our future. Nearly 36 per cent of our people are engaged directly in agriculture. But all the rest depend upon it. In the last analysis, commerce, manufactures, our home market, every form of activity, runs back to the bounty of the earth, by which every worker, skilled and unskilled, must be fed and by which his wages are ultimately paid. The farm products of the United States in 1906 were valued at $6,794,000,000 and in 1907 at $7,412,000,000. All of our vast domestic commerce, equal in value to the foreign trade of all the nations combined, is supported and paid for by the land. Of our farm areas only one-half is improved. It does not produce one-half of what it could be made to yield; not by some complex system of intensive culture, but merely by ordinary care and industry intelligently applied. It is the capital upon which alone we can draw through all the future, but the amount of the draft that will be honored depends upon the care and intelligence given to its cultivation.

"Were any statesman to show us how to add $7,000,000,000 annually to our foreign trade, it would be the sensation of the hour. The way to do this in agriculture is open. Our share in the increase would not be the percentage of profit allowed by successful trading, but the entire capital sum. On the other side stands the fact that the unappropriated area suited to farm purposes is almost gone, and that we have been for the last century reducing the producing power of the country. Nowhere in the range of national purposes is the reward for conservation of a national resource so ample. Nowhere is the penalty of neglect so threatening."

In conclusion Mr. Hill briefly indicated the method by which reform may be brought about. "I have endeavored to outline some of the principal issues at stake in the better conservation of our national resources, and especially that one about which all the others revolve and by whose fortunes we shall eventually stand or fall—the land itself. They are for us quite literally the issues of national existence. The era of unlimited expansion on every side, of having but to reach out and seize any desired good, ready provided for us by the hand that laid the foundations of the earth, is drawing to a close. The first task, it seems to me, must be to force home the facts of the situation into the public consciousness; to make men realize their duty toward coming generations exactly as the father feels it a duty to see that his children do not suffer want. In a democracy this is a first essential. In other forms of government one or two great men may have power to correct mistakes and to put in motion wise policies that centuries do not unsettle. A part of the price of self-government is the acceptance of that high office and imperative duty as a whole by the people themselves. They must know, they must weigh, they must act. Only as they form and give effect to wise decisions can the nation go forward. And we should not be here to-day were it not that the principle of a conservation of national resources as the foremost and controlling policy of the United States henceforth is coming to be seen by many, and must be heartily accepted by all, as the first condition not only of continued material prosperity, but also of the perpetuation of free institutions and a government by the people. The work now being done by the Department of Agriculture and the agricultural colleges of the various States furnishes a broad and intelligent foundation upon which to build up a new era of national progress and prosperity. It calls for a wise, generous, and continuing policy on the part of both Federal and State governments."

Two fundamental elements of reform in the management of our soils were brought out as the result of the conference, and it would be well if they should form the principal themes at a subsequent session.

First, it was made very clear that the exact nature of the problem and the methods of its solution must be determined by the patient labors of thoroughly trained experts. It was from what such experts have already done that the really important data contained in the addresses of the President, the governors, and other speakers were derived. The President did well to recognize the importance of the expert in his call for the conference, and the governors responded well in their choice of delegates to accompany them. While the governors properly occupied the foreground of this assembly and did most of the talking as the representatives of the people, they were backed and surrounded by a strong body of men to whom they could look with safety for sound knowledge and wise advice on the great questions before the conference. Among these experts were the heads of agricultural colleges and experiment stations and chiefs of the Department of Agriculture, with the Secretary at their head.

This recognition of the expert as an all-important factor in the solution of our agricultural problems argues well for the final outcome. It marks a great step of progress in the thought of our people regarding agriculture. It also lays on our agricultural experts and the institutions which train and employ them a responsibility the importance of which they are only beginning to realize. It furnishes an additional and conclusive argument for supplying the best facilities and the amplest opportunities for training the men who are to be the leaders in agricultural progress, for we now see as never before that on them will rest the burden of pointing out the ways by which the material salvation of this country is to be made sure.

But, secondly, our material salvation will not be made sure until the masses of men conducting our 6,000,000 farms are intelligent enough to understand and adopt the methods of soil conservation which the experience of ages and the researches of the experts show are most effective and permanent in their results. To accomplish this we must do what no country or age has ever done—educate our entire rural population to be progressive and up-to-date farmers. The only way to accomplish this is to begin with the country children, and the only place in which the new gospel of material salvation can be so taught as to reach and convert everybody is the public school.

We must not neglect to instruct our adult farmers through farmers' institutes, demonstration farms, Department and station bulletins, books, and the public press. But until the child of the farmer is properly taught from early youth so as to realize that he must do better than his forbears, and that on him rests a weighty responsibility to make the farm which he inherits or earns more fertile at his death than when he received it, can we hope for general arrest of soil exhaustion in the United States. If the child gets the right attitude of mind on this great question, the man will easily learn and practice the details of the method by which soil fertility is to be maintained and increased.

This is no new doctrine to readers of the Record. We are here simply affirming that one of the greatest lessons coming out of the White House conference is the imperative necessity for the universal vocational education of our rural people.

The act making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1909, signed by the President May 23, was noteworthy as marking the continuance of the general policy of the previous year, though enacted under conditions in some respects considerably altered. The opening of a new Congress had brought many changes in membership, and especially in the personnel of the committees charged with the preparation of the bill. In the House of Representatives Hon. Charles F. Scott, of Kansas, succeeded to the chairmanship of the Committee on Agriculture, the majority of the members of which had changed, and in the Senate the death of Hon. Redfield Proctor, of Vermont, prior to the consideration of the measure by that body, was followed by the protracted illness of his successor as chairman of the Committee on Agriculture and Forestry, Hon. Henry C. Hansbrough, of North Dakota. Furthermore, in the interim between the meeting of the Fifty-ninth and Sixtieth Congresses had occurred the financial depression with an accompanying diminution of revenues. The continuation of substantially all the lines of work under way with increased appropriations for every bureau, and the addition of a number of new duties, may therefore be regarded as a renewed expression of the popular interest in the agricultural industry and a realization of the necessity for its uninterrupted development.

The aggregate of the appropriations carried in the act is $11,672,106. This does not include an appropriation of $460,000 for the printing and binding of the Department, which appears in the appropriation act for sundry civil expenses. There are also permanent appropriations of $3,000,000 for the Federal meat inspection and of $528,000 for the Adams fund, both of which are administered by the Department, but not included in the act, making a grand total of $15,660,106 for the coming year, and an apparent increase over the previous year of $2,320,814, or about 15 per cent. A large part of this increase, however, is only nominal, as for the present year over $1,000,000 derived from receipts from forest reserves is available, whereas under the terms of the act for 1907–8 subsequent receipts must be turned into the Treasury. The real increase carried by the act is distributed through the work of the entire Department, but notably larger sums are available for what may be termed its administrative duties, such as the management of the National Forests, the pure food and drug inspection, and the campaign against the gipsy moth and cattle tick, as well as for additional buildings and equipment on the forest reserves and for the Weather Bureau.

In the matter of general legislation the act perhaps contains no measures of the large importance of the meat-inspection law or the Nelson amendment, which have been such notable features in previous years, although a number of new lines are provided, and some are of considerable importance. Among these may be mentioned the inauguration of evaporation investigations and of studies of the prevalence and extent of tuberculosis among dairy cattle, the establishment of a standard of cotton grading, the inspection of foods intended for export under certain conditions, and the making of denatured alcohol in small amounts under farm conditions. The sum of $10,000 is appropriated for the testing of plants as to their suitability for paper making, and a like sum is available for an inquiry into the destruction of forests by the production of turpentine and resin and the sources and methods of the industry, and for a report, in cooperation with the Bureau of the Census, upon the production of the naval stores industry.

The President was directed to reserve not to exceed 12,800 acres of the Flathead Indian Reservation in Montana for a permanent national bison range, for a herd of bison to be presented by the American Bison Society, $30,000 being appropriated for payment of these lands and $40,000 for fencing and the erection of buildings. An amendment diverting $5,000 annually from the Morrill and Nelson funds of Cornell University to the Mount Tabor Industrial and Manual Training School was adopted by the Senate, but eliminated in conference.

Under the new appropriation act the Weather Bureau receives $1,662,260, an increase of $248,720, the latter chiefly for the erection of additional buildings and the repair and improvement of those now completed. Of this amount $60,000 was appropriated for the erection of a main observatory building at Mount Weather, Va., to replace that destroyed by fire October 23, 1907, and for the erection of a central heating and lighting plant, together with $15,000 for the completion of a physical laboratory and other buildings. The establishment of new stations was authorized and $110,000 was appropriated for sites and buildings, of which $5,000 is to be used for the reëstablishment of the station at Pikes Peak. The work of the Bureau was increased in scope by the addition of investigations on evaporation. The limit of the cost of maintenance of the Bureau printing office was raised from $18,000 to $30,000.

The appropriation of the Bureau of Animal Industry was increased $48,300, making a total of $1,080,860, exclusive of the meat inspection which, as previously stated, is now provided for by permanent law, and also of the emergency appropriation for the eradication of the cattle tick in the South. The latter appropriation was increased from $150,000 to $250,000, of which $25,000 was made immediately available. Specific authority was conferred for the enforcement of the laws of March 3, 1891, relative to the humane treatment of cattle exported to foreign countries, and of June 29, 1906, for the prevention of cruelty to animals during interstate transportation. The investigation of the prevalence and extent of tuberculosis among dairy cattle in the United States was included in the lines of work to be undertaken; while a clause authorizing the expenditure of $5,000 for an investigation of hemorrhagic septicemia, infectious cerebrospinal meningitis, and malignant catarrh and for the working out, in cooperation with the Minnesota Station, of the problem of prevention by means of antitoxin or preventive vaccines was eliminated.

The Bureau of Plant Industry received an apparent net increase of $289,446, but this includes the boll-weevil work of the Bureau, which last year was carried as an emergency appropriation of $150,000. The general work of the Bureau was extended to include the establishment of an official standard of cotton classification. A clause making the grain standards fixed by the Department the official standards for grading was reported by the House committee, but stricken out on a point of order. The provision for grain inspection was continued on the present basis, except that it was included in the general work of the Bureau instead of from a specific appropriation. The work on the prevention of algal and other contaminations of water supplies was restricted to farm water supplies. The appropriation for the introduction of rare seeds and plants from foreign countries was increased $20,000, making $56,000 for this purpose, in addition to the Congressional seed distribution, which was continued on the usual basis.

The general policy of the Forest Service was again the subject of extended discussion. An increase of $1,496,200 was granted, making its total appropriation $3,896,200, by far the largest carried in the act. As has been explained, however, the greater part of this increase is in lieu of the forest receipts. The sum of $600,000, an increase of $100,000, was appropriated for the construction and maintenance of roads, bridges, telephone lines, cabins, fences, and other permanent improvements. A number of additional limitations were imposed restricting the entire appropriation to territory under the jurisdiction of the United States, reducing the limit of cost of buildings on the forest reserves from $1,000 to $500, and limiting traveling expenses to "business directly connected with the Forest Service and in furtherance of the works, aims, and objects specified and authorized in and by this appropriation."

The provisions of the previous year authorizing the extension of the National Forests and the giving of advice to owners of woodlands as to their care were eliminated, but authority to aid other Federal bureaus in the performance of their duties in respect to the National Forests was granted, and advances of money may hereafter be made to chiefs of field parties for fighting forest fires.

The Bureau of Chemistry received an increase of $128,800, chiefly for additional expenses incident to the enforcement of the National Food and Drug Act. Authority was granted to demonstrate and illustrate the methods for the making of denatured alcohol on a scale suited to the farmer or associations of farmers, and also to investigate the character of the chemical and physical tests which are applied to American food products in foreign countries, and, on request, to inspect such products when intended for export to countries requiring such tests.

The appropriation for the Bureau of Soils was increased to $234,700, a net increase of $27,800. Its work was provided for as at present except for some changes as to the scope of the tobacco investigations.

In the Bureau of Entomology the salary of the Entomologist was increased from $3,250 to $4,000. The total appropriation was increased $48,950, making $184,960, of which $10,000 is immediately available. This appropriation, however, includes the boll-weevil investigations which have been carried in an emergency appropriation. In addition, the Bureau has charge of the gipsy and brown-tail moth campaign, for which an emergency appropriation of $250,000, an increase of $100,000, was made, the entire appropriation being immediately available. The silk investigations in progress for several years are to be brought to a close.

In connection with the Bureau of Biological Survey it will be recalled that while the customary appropriation of $52,000 was granted last year, the Secretary was directed to report to what extent, if any, the work done by the Survey was duplicated by any other Department of the Government, and the practical value of the work to the agricultural interests of the country. This report, according to Chairman Scott of the House Committee on Agriculture, "demonstrates clearly that the work of the Bureau is not a duplication of any being done elsewhere, and that it is of direct and very great value to agriculture;" and the work of the Bureau was accordingly continued with an increase of $10,000 for biological investigations.

The total appropriation for the Office of Experiment Stations, including $720,000 for the stations under the Hatch Act, is $1,034,620, an increase of $21,400. This increase includes $3,400 for statutory salaries and $5,000 for agricultural education through farmers' institutes and agricultural schools, making $10,000 for the latter purpose. For the general maintenance of the Office and the irrigation and drainage investigations the appropriations of this year, $30,000 and $150,000, respectively, were continued. The appropriations for the stations in Alaska, Hawaii, and Porto Rico were increased $2,000 in each case to correspond with the increase to the State stations under the Adams Act, and $5,000 was granted for the establishment and maintenance of a station in the island of Guam. This island, embracing about 210 square miles, has a population of about 9,000, chiefly engaged in agriculture of a primitive sort, and it is planned to extend assistance to its inhabitants who are now experiencing great losses from a cocoanut disease recently introduced, which threatens the complete extinction of the industry.

An appropriation of $7,000 was also made to the Office for setting up and completing the apparatus formerly used in the nutrition investigations and the preparation for publication of results already obtained. In accordance with the current appropriation act, the respiration calorimeter and accessory apparatus belonging to the Government have been brought from Middletown, Conn., to Washington, and it is planned to install them in completed form in the basement of one of the new laboratories of the Department.

The Bureau of Statistics received an increase in its general fund for the collection of agricultural statistics of $7,000. Reductions on the statutory roll, chiefly through transfer, made a net gain of $1,700.

To provide for the increase in the general business of the Department consequent on that of the several bureaus, additional appropriations were granted of $13,700 for the Office of the Secretary, $4,900 for the Division of Accounts, $18,160 for the Division of Publications, and $5,200 for the Library. The Chief of the Division of Accounts was made administrative officer of the fiscal affairs of the Department. An increase of $39,200 was also allowed for contingent expenses, of which $25,000 is for the construction of shops, stables, and storage buildings to replace the present structures and $8,000 for rent.

The work of the Office of Public Roads was broadened to permit the furnishing of expert advice on road maintenance and administration, as well as on road building, and the appropriation was increased $17,340. A provision was inserted forbidding the rent or purchase of road-making machinery.

Large as is the aggregate appropriation for the Department, it represents only about 1.5 per cent of the entire Federal appropriation and a per capita expenditure of less than 20 cents; and, as has been indicated, much of this sum is in the nature of permanent improvements upon an investment.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Synthetical chemistry in its relation to biology, E. FISCHER (*Chem. News, 96 (1907), Nos. 2500, pp. 207–210; 2501, pp. 212–215*).—A lecture in which the author summarizes the progress which has been made in biological chemistry, particularly with reference to the synthesis of proteids.

Hydrolysis of the crystalline globulin of the squash seed (Cucurbita maxima), T. B. OSBORNE and S. H. CLAPP (*Amer. Jour. Physiol., 19 (1907), No. 4, pp. 475–481*).—On a moisture and ash-free basis glutaminic acid made up 12.35 per cent, arginin 14.44 per cent, and leucin 7.32 per cent of a total of 55.77 per cent cleavage products recovered. Other constituents were found in smaller proportions.

The hydrolysis of hordein, A. KLEINSCHMITT (*Ztschr. Physiol. Chem., 54 (1907), No. 1, pp. 110–118*).—The cleavage products of hordein were identified and the amount estimated. The principal cleavage product was glutaminic acid, with leucin, α-prolin, and phenylalanin next in rank, though in much smaller amount. Small proportions of other bodies were also recovered. Neither glycocoll nor lysin was found.

Concerning the specific rotation of proteids of the water and alcohol extract of cereal flours, LINDET and L. AMMANN (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 4, pp. 253–256*).—The specific rotation of the gliadin of wheat flour and of proteids from rye, barley, and maize was determined. For a new proteid present in rye and barley the name hordein is proposed.

Concerning glutamins, II, E. SCHULZE and C. GODET (*Landw. Vers. Stat., 67 (1907), No. 3–4, pp. 313–319*).—The solubility and other characteristics of glutamin were studied. This body, the authors conclude, can form compounds with acids. Tests with citric and oxalic acids gave crystalline compounds but they were not regarded as pure.

Concerning starch, W. H. BLOEMENDAL (*Wchnschr. Brau., 24 (1907), Nos. 33, pp. 436–438; 34, pp. 449–542; trans. from Pharm. Weekbl., 43 (1906), pp. 1249–1265*).—A summary of data on variations in the composition of starch grains, their specific gravity and constituents, and related topics.

The activity of trypsin and a simple method for determining it, O. GROSS (*Arch. Expt. Path. u. Pharmakol., 58 (1907), No. 1–2, pp. 157–166*).—A method for determining the activity of trypsin is proposed in which a solution of casein is used as a reagent.

On the equilibrium weights of ammonia, F. HABER and R. LE ROSSIGNOL (*Ber. Deut. Chem. Gesell., 40 (1907), No. 8, pp. 2144–2154; abs. in Phys. Chem. Centbl., 4 (1907), No. 23, p. 702*).—A repetition of investigations by Haber and van Oordt on this subject (E. S. R., 17, p. 525) is reported.

Contribution to the knowledge of calcium carbonate, II and III, W. MEIGEN (*Ber. Naturf. Gesell. Freiburg, 15 (1907), Oct., pp. 38–74*).—This is an exhaustive chemical study of calcium carbonate as produced under different conditions. For first part of this article see a previous note (E. S. R., 15, p. 645).

On the titrimetric determination of phosphoric acid by means of uranium, F. Repiton (*Monit. Sci., 4. ser., 21 (1907), II, No. 791, pp. 753, 754; abs. in Chem. Zentbl., 1907, II, No. 26, p. 2078; Chem. Ztg., 32 (1908), No. 20, Repert., p. 125*).—This is a modification of the cochineal method of Malot. It is asserted that the sharpness of the color reaction is greatly increased by using a cochineal tincture prepared as follows: Boil 4 gm. pulverized cochineal one hour with 100 cc. of water, replace evaporated water, and boil again. After cooling add 50 cc. of alcohol, mix, and filter. To the solution to be tested add 5 cc. of acetic acid solution of sodium acetate, dilute to 100 cc., boil, add a few drops of cochineal tincture, and titrate with uranium solution to a gray-green coloration. By this method an instantaneous change of color is obtained.

Chemical soil and fertilizer analysis, E. A. Mitscherlich (*Fühling's Landw. Ztg., 57 (1908), No. 1, pp. 7-15*).—This article reports further experience with methods referred to in a previous article (E. S. R., 18, p. 417). The controlling considerations in the working out of these methods have been (1) the need of accurate and uniform methods of examining fertilizers and soils, and (2) the recognition of the fact that plant food must be in soluble form to be assimilated by plants.

Studies made of the factors controlling the solubility of plant food in the soil with reference to the working out of an analytical method of determining availability of the soil constituents are briefly summarized. On the basis of the results thus obtained the author takes as a measure of the plant food which becomes available during the period of growth the amounts of the plant food constituents dissolved from the soil by 25 times its weight (on the dry basis) of water saturated with carbon dioxid, digesting with constant agitation for 11½ hours at 30° C.

The results obtained by this method on different kinds of soils unfertilized and receiving different amounts of fertilizing materials, as well as on a large number of samples of Thomas slag, are reported. While the method as a rule showed very distinctly the increase in plant food due to the addition of the fertilizing materials, it did not in many cases show increases agreeing with the amounts actually added. This is explained in some cases as due to chemical changes brought about in the soil by the action of the added material, and leads the author to conclude that soils vary to such an extent individually that no general rule can be laid down with reference to their fertilizer requirements.

The comparison of the carbon dioxid method of the author with the citric acid method of Wagner on various samples of Thomas slag showed that as a rule 8.9 per cent less of the total phosphoric acid was dissolved by the author's method than by that of Wagner. The author, however, claims that these results agreed more closely with the results of pot experiments than those obtained by the citric acid method.

The colorimetric determination of nitrogen in soils by the Nessler reagent, Chouchak and I. Pouget (*Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 24, pp. 1173-1180; abs. in Chem. Zentbl., 1908, I, No. 8, pp. 761, 762*).—Adaptations of the soda-lime and Kjeldahl methods to the determination of nitrogen in soils by the Nessler reagent are described, and tests of the convenience and accuracy of the adaptations are reported.

In case of the soda-lime method 0.3 gm. of soil taken from a carefully selected and finely ground sample of 20 gm. is mixed with 0.02 to 0.03 gm. of anhydrous oxalic acid, and after mixture with soda-lime in the usual way is subjected to combustion in a glass tube 8 to 10 mm. diameter and 20 to 30 cm. long. The various precautions to be observed in order to insure purity of reagents and prevent errors due to ammonia in the air are described in detail. It is claimed that with the small quantities of material and apparatus required complete combustion is much more easily carried out.

When the Kjeldahl process is used 0.2 to 0.6 gm. of the soil is digested with about 5 cc. of sulphuric acid until transformation of the nitrogen into ammonia is complete. The ammonia is distilled and Nesslerized in the usual way.

Tests of both methods are reported showing that a high degree of accuracy is possible.

On a method of determining small amounts of nitrogen and the application of the method in the detection of organic impurities in water, S. Korschun (*Arch. Hyg., 62 (1907), No. 1, pp. 92–106; abs. in Chem. Zentbl., 1907, II, No. 18, pp. 1548, 1549; Chem. Ztg., 31 (1907), No. 101, Repert. No. 93, p. 631*).—In the method proposed, from 200 cc. to 1 liter of the water is evaporated to 20 cc. after the addition of from 2 to 3 cm. of dilute sulphuric acid. From 5 to 8 cc. of concentrated sulphuric acid and about 1 gm. of potassium sulphate are then added and the solution boiled until colorless. The acid is neutralized and the ammonia determined by Nesslerization. The nitrogen in suspended matter in the water is determined by precipitation with fresh basic ferric acetate, the precipitate being collected and treated as described above.

Notes on volumetric determination of magnesium in water, G. B. Frankforter and Lillian Cohen (*Jour. Amer. Chem. Soc., 29 (1907), No. 10, pp. 1464–1467; abs. in Chem. Zentbl., 1907, II, No. 26, p. 2080*).—The authors call attention to an error in the calculations in the original description of Meade's modification of Stalba's arsenic method for determining magnesium in water. They also report tests of the corrected method in which better results were obtained without the use of starch as an indicator.

Contribution to the determination of oxygen in water, W. Cronheim (*Ztschr. Angew. Chem., 20 (1907), No. 45, pp. 1939–1942; abs. in Chem. Zentbl., 1907, II, No. 26, p. 2074*).—This article deals with sources of error in the Winkler method for the determination of oxygen in water and with corrections which must be applied in order to obtain reliable results.

The polarimetric determination of sucrose. III, The Clerget method, F. Watts and H. A. Tempany (*West Indian Bul., 8 (1907), No. 1, pp. 111–119*).—A critical study of the Clerget method is reported and some modifications are suggested. According to the authors, the results obtained "emphasize the very great accuracy of the process as an analytical method, and the indiscriminate use of factors regardless of the conditions for which they were determined can not be too strongly deprecated, as detracting from the intrinsic accuracy of what is undoubtedly one of the most accurate processes employed in organic analysis."

The polarimetric determination of starch, E. Ewers (*Ztschr. Öffentl. Chem., 14 (1908), No. 1, pp. 8–19*).—The article describes a polarimetric method of determining the starch content of such substances as grain, meal, bran, feeding stuffs, and potatoes.

To the sample in a flask acetic acid, hydrochloric acid, and hot water are added successively, with digestion in a hot water bath for a stated period at each addition. Potassium ferrocyanid is added to the cooled solution, which is then diluted to a given volume, filtered, and tested in a polarimeter. A blank test, similar to the above, with the omission of the hydrochloric acid, is also made, the data being used as a correction to those from the preceding test.

The reported results by this method agreed very closely with those by the MEvimetric method. The author believes that it is specially applicable for exhau the determination of the value of raw materials and products in starch making and in the distilling industry.

Determining the starch in barley by means of polarization, Windisch (*Ztschr. Spiritusindus., 30 (1907), Nos. 35, p. 379; 36, p. 391*).—A summary and discussion of data and a comparison of methods.

Note on the estimation of starch in commercial starch and starchy materials, E. Parow and F. Neumann (*Ztschr. Spiritusindus., 30 (1907), No. 52, pp. 563, 564*).—From a comparative study of methods, the authors suggest the use of a sodium-chlorid-hydrochloric acid solution as a solvent.

Composition of cacao crude fiber, II. Matthes and F. Streitberger (*Ber. Deut. Chem. Gesell., 40 (1907), pp. 4195–4199; abs. in Chem. Zentbl., 1907, II, No. 22, pp. 1806, 1807*).—A critical study of methods.

A comparison of methods for the determination of the alkalinity of ash, H. C. Lythgoe (*Ann. Rpt. Bd. Health Mass., 38 (1906), pp. 411–414*).—The incinerated ash was extracted successively with cold and boiling water and the extract titrated with decinormal sulphuric acid, using phenolphthalein, methyl orange, cochineal, and litmus as indicators. With phenolphthalein an excess of acid was added, the solution boiled until the carbon dioxid was expelled, and the excess of acid determined by titrating with decinormal alkali. Vinegar, lime juice, and raspberry sirup were the materials used. From this work, which is regarded as preliminary, the author concludes that phenolphthalein gives more nearly the correct results.

New method of separating and determining organic acid in fruits and vegetables, J. M. Albahary (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 22, pp. 1232, 1233*).—Since the direct analysis of plant extracts with water is time-consuming and unsatisfactory, the author extracts successively with chloroform, alcohol, and ether. The free organic acids are recovered in the ethereal and alcoholic extracts. In order to recover the acids present as salts the material is boiled before extraction with alcohol containing hydrochloric acid.

The determination of tartaric acid in the presence of malic and succinic acids, J. von Ferentzy (*Chem. Ztg., 31 (1907), No. 90, p. 1118*).—A brief note on the determination of tartaric acid as a basic magnesium salt, a method, which, according to the author, gave satisfactory results.

The determination of tartaric acid in cider, G. A. Le Roy (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 25, p. 1285*).—The method outlined depends upon the color reaction between a solution of resorcin and sulphuric acid.

A method of determining alcohol in wine, M. Duboux and P. Dutoit (*Schweiz. Wchnschr. Chem. u. Pharm., 45 (1907), Nos. 48, pp. 753–755; 49, pp. 773, 774*).—The critical temperature method in which variations are brought about by the proportion of water present. As shown by comparative determinations the values obtained agree closely with those by the specific gravity method.

Benzoic v. cinnamic acid in food analysis, W. L. Scoville (*Amer. Jour. Pharm., 79 (1907), No. 12, pp. 549–551*).—According to the author's experiments, it is difficult to differentiate between cinnamic and benzoic acid by the ordinary analytical methods, a matter which is of importance in the analysis of goods spiced with cinnamon.

"The best test found for distinguishing between the two acids is the manganous test. Manganous salts give a white precipitate with cinnamates, which gradually becomes crystalline. No precipitate is found with benzoates, even in moderately strong solutions. The precipitate forms slowly with cinnamates, but is quite delicate. The solution should be allowed to stand an hour, at least, with moderately weak solutions."

Rapid measurement of potassium bichromate in milk, Gouère (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 6, pp. 291, 292*).—To milk ash dissolved in cold water is added a solution of potassium iodid and hydrochloric acid. The liquid turns brown, due to iodin liberated. Standardized sodium hyposulphite is added from a burette until the brown color disappears and a blue color, due to chromium salt, is obtained free from yellow. This of itself serves as an indicator for the end point of the reaction. It is advantageous to use a solution of sodium hyposulphite of which 1 cc. is equivalent to 1 mg. of potassium bichromate.

Analysis of butter for the detection of falsification, D. Crispo (*Analyse du Beurre pour la Recherche de la Falsification. Antwerp, 1907, pp. 14*).—A brief account of the methods employed in official examinations in the laboratory of Antwerp.

A new constant for butter analysis, T. R. Hodgson (*Chem. News, 96 (1907), No. 2506, pp. 273, 274*).—In endeavoring to devise a method of detecting the presence of cocoanut oil in butter the author found the quantity of oxygen required to oxidize a given quantity of saponified butter fat invariable. This constant for butter fat he calls the oxygen equivalent. The method which he describes consists in oxidizing with potassium permanganate the acids obtained from butter fat after saponification with caustic potash and acidification with sulphuric acid.

The oxygen equivalent of cocoanut oil, T. R. Hodgson (*Chem. News, 96 (1907), No. 2507, p. 288*).—The oxygen equivalent of 20 samples of commercial cocoanut oil, not specially purified, was determined by the method previously described (see preceding abstract). The results for the different samples varied considerably, but the highest value was very much lower than that of butter fat.

A method for the detection of cocoanut oil in butter fat, T. R. Hodgson (*Chem. News, 96 (1907), No. 2508, p. 297*).—The oxygen equivalents of 9 mixtures of butter fat and cocoanut oil, one pure butter fat and one pure cocoanut oil, were determined by the author's method (see preceding extract). The quantity of cocoanut oil in the successive mixtures was increased regularly from 10 to 90 per cent. The results of the tests for the presence of the oil showed an almost constant difference, corresponding to the constant increase in the amount present. In 3 cases the calculated percentage of cocoanut oil agreed exactly with the actual, in 2 it was slightly above, and in 4 it was slightly below the actual amount.

The dependence of the Polenske number on manipulation, W. Arnold (*Pharm. Zentralhalle, 49 (1908), No. 13, pp. 237-241*).—The author believes that since variations in the Polenske number are so commonly caused by the character of the wire gauze used, e. g., with respect to the size of the mesh or the wire, whether the wire is copper or iron, etc., it is better to discard the net and conduct the distillation over the free flame.

The estimation of fat in feces, I. W. Hall (*Brit. Med. Jour., 1907, No. 2446, p. 1399*).—A rapid method of estimating fat in feces is described which is especially suitable for clinical purposes. Feces are treated with potassium hydroxid solution made up to definite volume and the fat in an aliquot sample is then extracted in a centrifugal machine or in some other way after treatment with alcohol and hydrochloric acid under the prescribed conditions.

The microscopy of technical products, T. F. Hanausek, trans. by A. L. Winton and Kate G. Barber (*New York and London, 1907, pp. XII+471, figs. 276; rev. in Amer. Jour. Pharm., 80 (1908), No. 1, p. 37*).—This is a handbook for the student and investigator of raw materials, with chapters on the microscope and its accessories, microtechnique and reagents, starch and inulin, vegetable fibers and the microscopic examination of paper, animal fibers, mineral fibers and textiles, wood of dicotyledons and gymnosperms, monocotyledonous stems, subterranean organs and barks, leaves, insect powder, fruits and seeds, including oil cakes, teeth, bone, horn, etc., and microchemical analysis.

A new apparatus for the rapid determination of dry matter in wheat gluten, W. Bremer (*Chem. Ztg., 31 (1907), No. 88, p. 1098, fig. 1*).—By means of especially constructed porcelain plates the author believes that gluten may be conveniently dried in a thin layer in a short time.

Use of the Abbe refractometer for the determination of dry substance in cane juice and sugar-house products, H. C. P. Geerligs (*Internat. Sugar Jour., 10 (1908), No. 110, pp. 68-81*).—A study of the use of the refractometer for the determination of dry substance in cane juices in preference to older methods, depending for success on the reading of the Brix hydrometer, is given in detail.

Agricultural chemistry in the first half of the year 1907, Zielstorff (*Chem. Ztschr., 7 (1908), No. 1, pp. 1-6*).—This article summarizes briefly the progress during the period named in investigations relating to the nutrition of plants and animals.

General index of Chemisches Centralblatt for the years 1902–1906, A. Hesse and I. Bloch (*Chem. Centbl., Gen. Reg. 1902–1906, pp. 1663*).—Both authors and subjects are indexed.

METEOROLOGY—WATER.

The study of the weather as a branch of nature knowledge, M. I. Newbigin (*Scot. Geogr. Mag., 23 (1907), No. 12, pp. 627–648, figs. 9*).—This is an address to teachers which attempts to show what there is to teach in connection with the weather and to suggest methods of teaching it.

Smithsonian meteorological tables, A. McAdie, C. F. Marvin, and C. Abbe (*Smithsn. Misc. Collect., 35, No. 1032, 3. rev. ed., pp. LX+280*).—This is the third revised edition of these tables, the first edition of which was issued in 1893. In this edition "all errata thus far detected have been corrected upon the plates, the Marvin vapor tensions over ice have been introduced, Professor F. H. Bigelow's system of notation and formulæ has been added, the list of meteorological stations has been revised, and the international meteorological symbols, together with the Beaufort notation, are given at the close of the volume."

Organization and development of the meteorological service of Mexico, M. E. Pastrana (*Heraldo Agr., 7 (1907), Nos. 11, pp. 24–26; 12, pp. 21–23*).

Monthly Weather Review (*Mo. Weather Rev., 35 (1907), Nos. 11, pp. 503–556, figs. 16, charts 8; 12, pp. 557–606, pls. 4, figs. 13, charts 8*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of November and December, 1907, recent papers bearing on meteorology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 11.—Phenomena connected with the San Francisco Earthquake, by C. M. Richter and A. G. McAdie; The Christmas Snowstorm of 1906 (illus.), by H. R. Mill; Well-marked Foehn Effects with Great Diurnal Ranges of Temperature in Southern California, by A. G. McAdie; The Central Pennsylvania Meteor of October 1, 1907, by H. A. Peck; The Relation of the Movements of the High Clouds to Cyclones in the West Indies, by J. T. Quin; A Method of Preserving Rainfall, by J. C. Alter; Studies of Frost and Ice Crystals, by W. A. Bentley; The Winds of the Lake Region (illus.), by A. J. Henry; Influence of Vegetation in Causing Rain; Weather Bureau Men as Educators; A Universal Seismograph for Horizontal Motion and Notes on the Requirements that Must be Satisfied (illus.), by C. F. Marvin; and Publication of Climatological Data from Cooperative Observers.

No. 12.—Comprehensive Maps and Models of the Globe for Special Meteorological Studies, by C. Abbe; The Jamaica Hurricane of October 18–19, 1815 (illus.), by M. Hall; Climatology of Jacksonville, Fla., and Vicinity (illus.), by T. F. Davis; The Utilization of Mist, Fog, Dew, and Cloud; Dew Ponds, by E. A. Martin; Temperature Courses (illus.), by H. Gawthrop; Seasonal Departures of Temperature at Philadelphia, Pa., during the Last Twenty Years, by H. Gawthrop; Electric Disturbances and Perils on Mountain Tops, by J. E. Church, jr.; Earthquakes on the Pacific Coast, by A. G. McAdie; Further Observations of Halos and Coronas, by M. E. T. Gheury; Notes on the Jamestown Tercentennial Exposition, by J. H. Spencer; Specific Gravity of Snow, by M. E. T. Gheury; Atmospheric Dust in the Gulf of Mexico, by E. Banvard; and Studies of Frost and Ice Crystals, by W. A. Bentley.

Meteorological observations (*Maine Sta. Bul. 150, pp. 331–333*).—The usual summaries of observations on pressure, precipitation, cloudiness, and wind movement at Orono, Me., and on precipitation at various places in the State during 1907 are given. The mean atmospheric pressure for the year at Orono was 29.84 in. The mean temperature was 41.93° F., the mean for 39 years being 42.22° F. The total precipitation was 42.49 in., the mean for 39 years being 43.81 in. The snowfall was 100.7 in., the average for 39 years being 91.9 in. The number of cloudy days was 151. "January was 3° and February 5° below the average, while March, April, and May fell from 1 to 3° below the average. On the other hand, December was over 7° above the average for that month. Other minor compensations brought the mean temperature of the year within 0.29° of the average. The precipitation was very unevenly distributed, with a total 1.32 in. below the average."

Meteorological records for 1906 (*New York State Sta. Rpt. 1906, pp. 460–470*).—Tables are given which show tridaily readings of the standard air thermometer during each month of 1906, daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year, a monthly summary of maximum, minimum, and standard thermometer readings, average monthly and yearly temperature since 1882, monthly and yearly maximum and minimum temperatures from 1883 to 1906 inclusive, and rainfall by months since 1882.

Meteorological, magnetic, and seismic observations of the College of Belen of the Society of Jesus, Havana, 1906, L. GANGOITI (*Observatorio Meteorologico, Magnetico y Seismico del Colegio de Belen de la Compañia de Jesus en la Habana, año de 1906. Havana, 1907, pp. 86, dgms. 3*).—A detailed report, largely tabular and diagrammatic, of the usual observations.

Meteorological observations, T. F. SEDGWICK (*Mem. Estac. Expt. y Lab. Caña Azucar, 1906–7, pp. 45–49*).—Summaries are given of observations at a number of points in Peru on temperature during each month of 1904, 1905, and 1906, and for the first half of 1907.

The weather of the year 1905 in Hertfordshire, J. HOPKINSON (*Trans. Hertfordshire Nat. Hist. Soc., 13 (1907), No. 1, pp. 33–48*).—This is a continuation of long-period observations at Watford, St. Albans, and other stations in Hertfordshire, the report for 1905 being made up from observations at 53 stations. As usual, tabular summaries are given of observations on temperature, rainfall, humidity, sunshine, and cloudiness, and the weather conditions of each month are described. The data for rainfall are particularly full.

"The year 1905 was, on the whole, warm and dry; the air was of average humidity, the sky rather more cloudy than usual. Though the rainfall was deficient in quantity, in frequency it slightly exceeded the average, and there were many heavy falls.

"The mean temperature was 48.9°, being 0.6° above the average; the mean daily range was 14.5°, being 1.4° below the average, the excess of temperature thus being due to the warmth of the nights. The rainfall was 23.48 in., being 1.29 in. below the average for the decade 1890–1899, and 2.66 in. below that for the 60 years 1840–1899. The number of wet days was 169, being one more than the average for the 30 years 1870–1899. . . .

"The rainfall in Hertfordshire continues to be in excess of that of the adjoining counties, and in 1905 did not only exceed their average but was greater than that of any one of them. . . .

"Two meteorological events in the year call for special notice, a hurricane at St. Albans, and elsewhere, but very locally, in the South of England, on Wednesday, March 15, and the thunderstorms which raged all over the county, and in fact extended all over the kingdom, on Sunday, July 9."

Report on phenological phenomena observed in Hertfordshire during the year 1905, E. Mawley (*Trans. Hertfordshire Nat. Hist. Soc., 13 (1907), No. 1, pp. 81–88*).—This is the usual record of such observations relating to the progress of the seasons, the dates of flowering of plants, and the migration of birds and insects. The report is compiled from observations at 12 different places in the county.

The growing season was unusually long and favorable to farm crops. "The yield of wheat was 4 per cent above the average for the previous ten years, barley 2 per cent above, oats 3 per cent above, beans 16 per cent above, peas 11 per cent above, turnips 16 per cent above, mangolds 14 per cent above, and hay (clover, etc.) 8 per cent above, while potatoes were an average crop, and hay (permanent pasture) 1 per cent below the average for the same ten years. It will thus be seen that of all the farm crops there was only one in which the yield was in any way below average.

"The fruit crops, according to the returns sent in to the *Gardeners' Chronicle*, on the other hand, were, taking the county as a whole, remarkably poor, the yield of apples and plums being very small, those of pears and strawberries rather better but still under average, while the crops of raspberries, currants, and gooseberries were, if anything, rather in excess of their respective averages."

The meteorology of Scotland during 1906 (*Jour. Scot. Met. Soc., 3. ser., 14, No. 24, pp. 149–216*).—Details of meteorological observations throughout Scotland are given in tables and notes.

[Temperature and rainfall of Cape of Good Hope] (*Statis. Reg. Cape Good Hope, 1906, pp. 31, 32*).—Tables are given which show the maximum and minimum temperature of each month of the year and the total rainfall as compiled from records at typical stations in different parts of the colony.

Hourly meteorological observations at the Manila central observatory, 1905 (*Ann. Rpt. Philippine Weather Bur., 1905, pt. 1, pp. 155*).—This report records the results during 1905 of hourly observations at the central observatory at Manila on atmospheric pressure, temperature, relative humidity, vapor tension, direction and force of the wind, and direction, form, and amount of clouds. There are also general notes on the weather conditions of the year.

Some air temperature readings at several stations on sloping ground, R. S. Vinson and E. J. Russell (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 221–226, figs. 2*).—Temperature observations at several stations on a slope about 1¼ miles long, with a total difference in altitude of 580 ft., are recorded and discussed with reference to danger of spring frosts in different parts of the area. The temperature readings were made at 6 in. and at 2 meters above the ground from April 14 to May 31. They show a distinct fall of temperature with decreasing altitude, and that low land is distinctly colder by night and hotter by day than more elevated land. It was also observed that a small river flowing along the lower edge of the area increased the temperature of the air and lessened danger of frost to a distance of 196 ft. from its edge.

Clouds, rains, and fires, H. MÉMERY (*Rev. Néphologn., 1907, No. 21, pp. 161, 162; Nature [Paris], 35 (1907), No. 1796, Sup., p. 170; abs. in Lit. Digest, 35 (1907), No. 23, p. 867*).—A note on this subject which casts doubt on the popular belief that heavy rainstorms frequently follow great fires, a subject to which attention is called by R. Radan in his work on The New Meteorology and the Prediction of the Weather.

Rain-producing east winds and their influence on the summer of 1907, R. RICHARDSON (*Jour. Scot. Met. Soc., 3. ser., 14, No. 24, pp. 141-143*).—This paper attempts to show that the frequent sudden shiftings of the wind to the east on the east coast of Scotland did much to produce the cold and rainy weather which characterized the summer of 1907.

Rainfall on the plains, L. G. CARPENTER (*Colorado Sta. Bul. 123, pp. 21-32*).—Observations on rainfall during 37 years at Denver, 27 at Fort Collins, 11 at Wray, 14 at Hamps, 16 at Yuma, 17 at Leroy, 16 at Cheyenne Wells, and 18 at Rocky Ford are summarized in this bulletin. The distribution of the rainfall throughout the season and its variation in different years are briefly discussed. In general it is stated that nearly 50 per cent of the rainfall of Colorado comes during the growing season.

Notes on rainfall at Savannah, Georgia, J. DE BRUYN-KOPS (*Proc. Amer. Soc. Civ. Engin., 33 (1907), No. 10, pp. 1101-1110, pl. 1*).—An analysis is given of rainfall data at this place, which shows that formulas of maximum rates of rainfall, such as that of Talbot, can be reliably applied to only a single locality and not to any extensive region.

Hailstorms in Prussia in 1905 (*Preuss. Statis., 1906, No. 202, pp. 26-65*).—Statistics are given of the occurrence of hailstorms and the damage caused by them in different provinces and districts of Prussia.

A simplification of Gallenkamp's rain-measuring apparatus, A. SPRUNG (*Instrumentenkunde, 27 (1907), No. 11, pp. 340-343, figs. 2*).

Observations on the underground waters in forest and open soil, V. IVANOV and D. SAZHIN (*Pochvovyedyenie [Pedologie], 1906; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 4, p. 479*).—From 2 years' observations on the fluctuations of the underground waters in the forest and the open, the authors conclude that in clearings in woods the water level fluctuates more with variation in rainfall than in the forest soil. With light rainfall the water stands higher in the forest than in the open soil.

Well waters from farm homesteads, F. T. SHUTT (*Canada Expt. Farms Rpts. 1906, pp. 196-199*).—The 90 samples of water of which analyses are here reported are classified as follows: Good and wholesome 28, suspicious and probably dangerous 21, contaminated and totally condemned 30, saline 11.

Drinking water on the farm, J. DENOËL (*Ann. Gembloux, 18 (1908), No. 1, pp. 44-50*).—This is referred to as a most important subject which is sadly neglected in Belgium. The practical means of securing and maintaining a wholesome water supply under conditions generally prevailing in Belgium are discussed, attention being called especially to the increasing danger of pollution of the farm water supply with extension of cattle raising, particularly on pasture, and from the careless disposal of carcasses of diseased animals on the farm.

[Sewage disposal at Nottingham, England] (*Mark Lane Express, 97 (1907), No. 3978, p. 763*).—A brief account is here given of the management of the sewage farms, comprising an area of over 1,800 acres, of the city of Nottingham. On these farms the system of broad irrigation is practiced, and by means of an elaborate system of underdraining from 10,000,000 to 12,000,000 gals. of sewage is handled every 24 hours, the land being treated continuously for 12 hours at a time. About 1,000 acres of the land is under cultivation, the principal crops grown being wheat, oats, rye, kohl-rabi, and cabbage, some of the latter reaching enormous size. The soil for the most part is of a sandy character with gravelly subsoil and good natural drainage. It is stated that the annual returns from these farms are about $111,929.50.

SOILS—FERTILIZERS.

The composition and properties of some Texas soils, G. S. Fraps (*Texas Sta. Bul. 99, pp. 50, figs. 20*).—This bulletin reports the results of a systematic examination of definite areas and types of Texas soils which has been carried on for several years largely in cooperation with the Bureau of Soils of this Department. "In addition to the chemical analyses, tests for deficiencies were made by pot experiments on some of the soils, and some were also treated with solvents to determine the active plant food present." The analytical data are accompanied by discussions of the general principle of soil fertility, the causes of small crops, the means of maintaining and increasing soil fertility, and the properties and deficiencies of the soils studied. The analyses reported include 8 samples of the Norfolk series, 9 of the Orangeburg series, 8 of the Houston series, 4 of the Lufkin series, 3 of the Susquehanna series, and 2 of the Yazoo series.

"It appears that the different groups of soils have definite chemical characteristics, which are related to their productiveness. The Norfolk soils contain less plant food and are less productive than the corresponding Orangeburg soils. The Houston and Yazoo soils, which are very productive, are well supplied with plant food and lime. The Susquehanna and Lufkin soils, which have low crop values, are low in plant food. The individual soils in the series vary to some extent, as may be expected, but the group characteristics generally prevail."

The soils are considered collectively and also with reference to their distribution by counties, the counties represented being Houston, Anderson, Lamar, Travis, Bexar, and Hays.

Among the physical and chemical causes of low crop yields considered are acidity, alkali, deficiency in active plant food, in active lime, and in organic matter. While it is maintained that chemical analysis may be of great value in determining the fertility of soils, it is pointed out that analysis must be considered in connection with other factors which influence fertility. In the author's opinion "chemical analysis with strong acids gives information in regard to the strength and wearing qualities of the soil, and is of more permanent value than estimation of the active plant food, because the amount of the latter may change from year to year. Pot experiments give information in regard to the immediate needs of the soil for plant food." In the pot experiments made to test the immediate needs of the soils for phosphoric acid, potash, and nitrogen, it was found that the soils in almost all cases responded to phosphoric acid, very often to nitrogen, and not very often to potash.

The chemical composition of some Texas soils, G. S. Fraps (*Texas Sta. Bul. 100, pp. 8*).—This is a popular account of results of a study of a number of representative Texas soils, samples of which were collected in connection with the soil surveys of the Bureau of Soils of this Department. The soil types and areas represented are described and the fertilizer requirements of the individual soils are discussed.

Preliminary report on surface soils from the Abitibi region, F. T. Shutt (*Canada Expt. Farms Rpts. 1906, pp. 153–155*).—Analyses of 13 samples from this region are reported. These show in a majority of cases a low percentage, or deficiency, of nitrogen. As a class the soils are designated as retentive and lasting, and are in general such as will be improved by drainage and a rotation of crops which will increase their humus and nitrogen contents.

Notes on the character of the soil between Langdon and Gleichen, Alberta, in western section of irrigation block of the Canadian Pacific Railway Company, F. T. Shutt (*Canada Expt. Farms Rpts. 1906, pp. 194–196*).—This is a brief report prepared from notes taken during a rapid survey of this region.

An investigation of soils of southern Sweden, M. Weibull (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 2–3, pp. 107–178, figs. 4*).—The paper presents a critical study of the results of chemical and mechanical analyses of Scania soils and of fertilizer trials with these soils made by the author since 1900, the object in view being to classify the soils and to examine in how far the results of the soil analyses furnish data of practical importance for this region. See also a previous note (E. S. R., 19, p. 515). The analytical data include mechanical analyses, determinations of loss on ignition, hygroscopic water, nitrogen, phosphoric acid, potash, lime, iron, and alumina, and also petrographic and geological examinations. The classification of the soils—which are in the majority of cases light glacial clays—was made according to their contents of alumina soluble in boiling concentrated sulphuric acid (kaolin and zeolite content), gravel, humus, and lime content, as follows:

(A) Mineral soils:
  (1) Low in lime, humus, and gravel (less than 10 per cent lime and humus, and 20 per cent stone and gravel)—
    (a) Stiff clays containing more than 7.5 per cent sulphuric-acid-soluble alumina.
    (b) Medium clays containing 5 to 7 per cent sulphuric-acid-soluble alumina.
    (c) Light clays containing 2.5 to 5 per cent sulphuric-acid-soluble alumina.
    (d) Clayey sandy soils containing 1.25 to 2.5 per cent sulphuric-acid-soluble alumina.
    (e) Sandy soils containing less than 1.25 per cent sulphuric-acid-soluble alumina.
  (2) High in lime, containing more than 10 per cent lime.
  (3) High in humus, 10 to 20 per cent loss on ignition ("humus").
  (4) Gravel and stony soils, containing more than 20 per cent stones or gravel.
(B) Humus soils more than 20 per cent loss on ignition.

The following table shows the main average results obtained in the chemical examination of these various kinds of soils:

Average results of chemical analyses of Scania soils, 1900–1906.

	Clayey soils.			Sandy soils.		Humus soils.	
	Heavy (4 samples).[a]	Medium (20 samples).[a]	Light (61 samples).[a]	Clayey (20 samples).[a]	Pure (12 samples).[a]	Low in humus (8 samples).[a]	Pure (10 samples).[a]
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Hygroscopic water	3.980	2.950	2.830	1.700	2.040	3.45	8.97
Loss on ignition	8.380	6.740	5.010	5.050	5.070	13.14	39.58
Humus [b]	4.200	4.000	3.500	3.600	3.800	----------	----------
Total nitrogen	.300	.260	.210	.220	.190	.47	1.47
Nitrogen in humus	7.100	6.500	6.000	6.100	5.000	----------	----------
Alumina soluble in sulphuric acid	8.640	6.370	3.800	2.060	.600	4.09	1.48
Alumina soluble in hydrochloric acid	4.190	3.640	2.050	1.340	.470	1.80	.99
Kaolin-Al_2O_3	4.450	2.730	1.750	.720	.130	2.29	.49
Corresponding to kaolin	11.200	6.800	4.300	1.700	.300	----------	----------
Phosphoric acid	.097	.080	.085	.095	.097	.07	16
Iron and alumina	13.880	10.740	6.770	4.390	2.910	6.88	4.40
$P_2O_5:Fe_2O_3+Al_2O_3::1:$	143.000	138.000	80.000	52.000	33.000	98.00	28.00
Potash	.272	.204	.144	.108	.080	.14	.12
Lime [c]	.520	.470	.440	.300	.270	.50	----------
Calcium carbonate ($CaCO_3$)[c]	0.000	.260	.330	.230	.200	.49	4.41
Sediment (Wagner)	63.100	46.000	32.700	22.500	18.400	35.20	----------

[a] In some cases the figures given do not represent the exact number of samples analyzed

[b] Reduction factors: 0.5 for heavy and 0.6 for medium clays, 0.7 for light clays and for clayey sandy soils, and 0.75 for sandy soils.

[c] Averages for 4 to 46 different samples of the various classes.

The main results of the fertilizer trials made on these soils with small grains, potatoes, root crops, and meadows are summarized by the author and studied in connection with the analytical data obtained. The following is a brief summary of the conclusions drawn from these trials:

Nitrogen.—Although the nitrogen content of the mineral soils was very high (average 0.23 per cent), the large majority of the soils responded especially to nitrogen fertilization, and as a general rule, only the soils containing more than 0.5 per cent nitrogen (and more than 10 per cent loss on ignition) either did not react or reacted only faintly. In the other soils (the mineral soils proper) no relation was to be observed between the need of nitrogen fertilization, as indicated by the yields obtained, and the nitrogen content of the soils, whether the absolute nitrogen content (percentage in the soil) or the relative nitrogen content (percentage in humus) was considered. The explanation is doubtless that the utilization of nitrogen by crops does not primarily depend on the amount of nitrogen in the soil, but on the amount of assimilable nitrogen found therein and on the intensity of the nitrification process. The colorimetric method of O. Reitmair is recommended by the author for the study of the relation of nitric nitrogen in soils and the results obtained in fertilizer tests. The results thus obtained may tend to explain the difference in the action of nitrogenous fertilizers on different soils and lead to the still more important result, to determine by soil analysis (i. e., in the laboratory) whether a high or low nitrogen fertilization will pay best in the case of a particular soil.

Phosphoric acid.—The percentage content of phosphoric acid can be very low, even toward 0.03 per cent, and still medium crops of at least the small grains be obtained without phosphoric acid fertilization. Most of the soils (about two-thirds of them) responded to applications of phosphoric acid fertilizers, and the soils low in phosphoric acid (containing below 0.07 per cent) more often gave reaction with this fertilizer than those high in phosphoric acid (above 0.10 per cent). A closer study of the results obtained show, however, that one can not draw any conclusions as to the need of phosphoric acid fertilization from the content of phosphoric acid (soluble in warm 18 per cent hydrochloric acid) in the soil. Only the root crops appear always to respond to phosphoric acid fertilization when the soil contains small amounts of phosphoric acid (below 0.07 per cent). Contrary to the conclusion of Liebscher and others, the author does not find that the iron oxid or alumina contents of soils are of any value for determining their need of phosphoric acid fertilizers.

Potash.—The total potash content of these soils ranged between 1 and 2 per cent, and that soluble in 18 per cent hydrochloric acid, from 0.03 to 0.45 per cent, the latter content, generally speaking, running parallel to the zeolite content and the alumina soluble in sulphuric acid (kaolin and zeolites). The fertilizer trials showed that about one-half of the soils needed potash, but there is apparently no direct relation between this need and the potash content of the soils or their physical character (light or heavy soils), the former soils responding frequently, while the latter occasionally did not need potash. The need of potash is apparently dependent on both of these factors, and each alumina content has a certain corresponding normal potash content, above or below which an addition will not or will be required. A chart is given showing the relation between the alumina and the potash contents of the soils in question (1 per cent Al_2O_3 : 0.085 per cent K_2O, 2 per cent Al_2O_3 : 0.11 per cent K_2O, 3 per cent Al_2O_3 : 0.13 per cent K_2O, etc.). Besides the potash and alumina contents of the soil, its potash requirements also depend to some extent on the particular crop grown, the normal crop yield, and the presence of lime in the soil.

Lime.—About two-thirds of the soils examined contained sufficient lime. The sandy soils were most frequently in need of this ingredient, less frequently the light clays, and but rarely the heavy clays. In the case of the latter soils the effect of the lime on the physical condition of the soils was, however, of importance.

[Analyses of tea soils], A. C. Kingsford and M. K. Bamber (*Report on the tea industries of Java, Formosa and Japan. Colombo, 1907, pp. 11–14*).—Mechanical and chemical analyses of a number of typical tea soils from different parts of Formosa are reported in comparison with the results of analyses of Ceylon tea soils and classified with reference to the quality of tea produced.

Reports upon the Irish peat industries, part 1, H. Ryan (*Econ. Proc. Roy. Dublin Soc., 1 (1907), No. 10, XVIII, pp. 371–420, pls. 3, figs. 8; abs. in Nature [London], 76 (1907), No. 1977, pp. 528–530, figs. 4*).—This is an abridgment of a paper giving an account of the distribution and industrial utilization of the peat deposits of Ireland. It refers especially to the reclamation of peat bogs by drainage, burning, and manuring, and the utilization of the peat for fuel, fiber, distillation, and for the manufacture of moss litter, paper, etc., with accounts of machinery and processes employed.

Method of treatment of peat and peat bogs, A. Müntz and A. C. Girard (*French Patent 377,711, July 18, 1906; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 20, pp. 1100, 1101*).—A method of utilizing peat in the preparation of ammonium salts for use in agricultural industry is described. The method is based upon scientific investigations which have already been noted (E. S. R., 18, p. 430).

Burning clay soils for cultural purposes, W. Bagger (*Deut. Landw. Presse, 34 (1907), No. 88, pp. 694, 695*).—A method of burning clay for the construction of small lateral drains is described and recommended.

The control of moisture in orchard soils, F. T. Shutt (*Canada Expt. Farms Rpts. 1906, pp. 150–153*).—The experiments of previous years on this subject (E. S. R., 18, p. 117) were continued during 1906. The data obtained were strongly confirmatory of those secured in previous seasons, emphasizing more particularly the value of mulching as a means of conserving soil moisture and bringing out prominently the fact that the unrestricted growth of weeds dries out the soil practically to the same extent as sod.

The work of the chemical laboratory of the Ploti Agricultural Experiment Station in 1906, B. M. Welbel (*Ghodichnuii Otchet Ploty. Selsk. Khoz. Opuitn. Stantzii, 12 (1906), pp. 148–228, 248–262*).—This report summarizes especially 5 years' work with lysimeters to determine the ratio of percolation to precipitation, the rate and progress of nitrification and denitrification in the soil, and the extent and loss of nitrates in drainage water.

It was found that on an average about 24 per cent of the precipitation passed through the soil of lysimeters 20 cm. (7.88 in.) deep and 35 per cent through lysimeters 40 cm. (15.76 in.) deep, the percolation, however, varying widely with the conditions of season, temperature, wind, amount and intensity of rainfall, and other conditions.

The lysimeter studies have also shown that nitrification is very variable during the year. During the first 18 months after the lysimeters were filled nitrification was much more active than in later years when the soil had become more compact. Denitrification at the same time apparently increased. These changes were more marked in the surface soil than in the subsoil. Nitrification has been found to be most active during the spring and summer. The amounts of nitric acid produced during the 5-year period are shown in the following table:

Nitric acid (HNO_3) produced during 5 years in different lysimeters.

Lysimeter.	Nitric acid per acre.	
	20 cm. (7.88 in.) lysimeter.	40 cm (15.76) lysimeter.
	Pounds.	*Pounds.*
No. 1, leguminous plants followed by black fallow	1,272.79	1,687.85
No. 2, spring wheat	1,335.14	1,776.92
No. 3 [a]	1,593.44	2,020.08

[a] Manured in case of 20 cm lysimeters and planted to alfalfa in case of 40 cm. lysimeters.

The figures indicate that nitrification is almost as active in the subsoil as in the surface soil when, as in this case, the subsoil is well aerated.

In lysimeters which were built so as to inclose the soil without disturbing it only from 2.5 to 3.5 per cent of the precipitation passed through lysimeters 25 cm. (9.85 in.) deep, and in case of deeper lysimeters not more than 1 per cent. In the same kind of lysimeters the total loss of nitrates in the drainage was very small, amounting during 4 years to only 7.3 lbs. of nitrogen per acre in lysimeters 25 cm. deep, 1.96 lbs. for lysimeters 75 cm. (29.55 in.) deep, and 0.9 lb. for lysimeters 1 meter (39.4 in.) deep. The annual losses from this source per acre amounted to only 0.22 lb. for soil to a depth of 1 meter, 0.44 lb. to a depth of 50 cm., and 1.78 to 3.56 lbs. to a depth of 25 cm. These are losses which are fully restored by the nitrogen of atmospheric precipitation.

The data obtained in the studies showed a close agreement between the progress of nitrification in the soils and the nitrate requirements of crops. For example, a crop of winter wheat or rye takes up from 71.25 to 97.97 lbs. of nitrogen per acre, while, according to results obtained in these observations, from 75.71 to 100.65 lbs. of nitric nitrogen are produced in the soil to depths of from 20 to 40 cm.

An experiment on further improvement of pure culture inoculation methods for leguminous plants, K. STÖRMER (*Mitt. Landw. Inst. Leipzig, 1907, No. 8, pp. 113–126, fig. 1*).—The article briefly reviews the present status of inoculation methods, pointing out the fact that the main object now to be attained is to increase the virulence of the tubercle bacteria. In order to accomplish this it is necessary to protect the bacteria from the injurious effect of excretions from the germinating seeds on which the cultures are used, and to secure cultures which during germination of the seed will produce strong infection in the soil in the vicinity of the roots of the plant.

The author reports experiments on soy beans in which the tubercle bacteria were grown in various media and protected from the injurious effect of the excretions of the germinating seed by applications of powdered calcium carbonate and gypsum to the seeds while still moistened with the culture solution. It was found that the addition of milk alone to the tubercle cultures was not sufficient to prevent injury. Better results were obtained with cultures containing peptone and grape sugar. The use of lime and gypsum greatly increased the formation of root tubercles, but these substances could not replace the ordinary nutritive materials. The use of calcium carbonate increased the production of tubercles and tubercle nitrogen at least 33 per cent. A similar result was obtained in one experiment with gypsum.

The method of using these materials was as follows: Immediately after the treatment of the seed with the tubercle bacteria cultures in milk, 1 per cent peptone, and 1 per cent grape sugar, a small amount of chemically pure calcium carbonate and gypsum was sprinkled on the seed, which was stirred until each seed was covered with a light coat of the powdered material.

The author considers the method of inoculation of leguminous plants with pure cultures of root tubercle bacteria to be a practical, cheap, and safe method of insuring that each kind of leguminous plant will have the required tubercle bacteria, and that the method can be used to advantage in many cases, as, for example, when cultivating new land for the first time, in case of introduction of new leguminous crops, and with 6 or 10 year rotations of crops.

A case of failure of inoculation to increase the yield of soy beans is reported, but an examination of the product showed a considerably higher content of nitrogen in the inoculated than in the uninoculated plants.

An experiment by a farmer showing the beneficial effect of inoculation on peas is briefly reported.

Process of growing and distributing nitrogen-gathering bacteria, G. H. EARP-THOMAS (*U. S. Patent 865,965, Sept. 10, 1907; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 20, p. 1100*).—The method and apparatus used in this process for producing root tubercles on various leguminous plants and preparing culture media from these tubercles are described.

The ferments of the soil and the nutrition of plants, D. HERMENEGILDO GORRIA (*Mem. R. Acad. Cien. y Artes Barcelona, 3. ser., 6 (1907), No. 20, pp. 50*).—This is a general review of the progress and present status of investigation on this subject.

A comparison of chemical methods with field tests for determining the fertilizer requirements of soils, H. SNYDER (*Minnesota Sta. Bul. 102, pp. 35–38*).—The amounts of phosphoric acid and potash soluble in fifth-normal nitric acid in 21 different soils on which fertilizer tests with wheat and corn were carried on are reported.

With one exception the soils which were benefited by applications of phosphates showed low percentages of phosphoric acid soluble in fifth-normal nitric acid. In all of the trials with the one exception referred to soils which contained over 150 parts per million of phosphoric acid soluble in fifth-normal nitric acid were not benefited by application of phosphatic fertilizers.

The soil showing the smallest amount of potash soluble in fifth-normal nitric acid gave the largest increase when potash fertilizer was added, while that containing the largest amount of soluble potash gave no increase with potash fertilizer. The chemical tests showed a deficiency of phosphates more distinctly than a deficiency of potash.

Peas as a fertilizer in the Northwest, F. T. SHUTT (*Canada Expt. Farms Rpts. 1906, pp. 155–158*).—This is a brief general discussion of the value of peas as a substitute for clover for soil improvement in this region. Data are given which show that crops of peas can be grown supplying 130 lbs. of nitrogen per acre, which is practically identical with that produced by alfalfa, vetches, and many of the clovers. The organic matter produced is equal in quantity to that yielded by a good clover crop, though somewhat less than that produced by alfalfa. The pea crop shows large percentages of phosphoric acid and potash, particularly the latter.

Experiments with nitrate of soda, ammonium salts, and lime nitrogen as fertilizers, P. WAGNER, G. HAMANN, and A. MÜNZINGER (*Arb. Deut. Landw. Gesell., 1907, No. 129, pp. VI+286; abs. in Mark Lane Express, 97 (1907), No. 3975, p. 677; Mitt. Deut. Landw. Gesell., 22 (1907), No. 42, pp. 364–366*).—This is a report of a continuation of cooperative experiments which have been carried out since 1901 under the auspices of the German Agricultural Society by the Wagner or Darmstadt method of field experimenting (E. S. R., 15, p. 234; 18, p. 621). The detailed data are given of 34 experiments of from 1 to 7 years' duration at 12 different places with oats, barley, wheat, beets, and potatoes, together with a summary of the results of these and similar experiments.

Wagner concluded from a large number of pot experiments that ammonium salts have 94 per cent of the fertilizing efficiency of sodium nitrate. In field experiments a much lower efficiency for the ammonium salts was indicated, better results being obtained with grains than with beets. For the production of grain ammonium sulphate was 75 per cent as efficient as nitrate of soda, for production of beets 68 per cent. As a general result of all the field experiments the practical fertilizing efficiency of ammonium sulphate in field culture is placed at 75 per cent of that of nitrate of soda. The possible causes of the lower efficiency of ammonium salts, namely, escape of ammonia into the air, transformation of the ammonia into organic substances, and a very strong fixation of nitrogen in clay soil, are discussed as in previous reports (E. S. R., 18, p. 621).

In case of grain 34.1 lbs. of nitrate nitrogen was equal to 45.54 lbs. of nitrogen in ammonium sulphate. The relationship in case of beets was not so clearly indicated. There was a very slight difference in the ratio between grain, or roots, and straw, or leaves, under the influence of the different fertilizers. Heavy manuring with the nitrogenous fertilizers always resulted in an increase in the proportion of straw or leaves as compared with grain or roots, the increases being greater in all cases with nitrate than with the other nitrogenous fertilizers. The differences, however, are considered too small to be of any practical importance. The application of the nitrogenous fertilizers in every case slightly increased the nitrogen content of the grain or roots, but decreased that of the straw and leaves. The differences are too small to be of practical importance, and other factors, such as soil, weather, variety, etc., seem to have much greater influence than the fertilizing. It is estimated that the soils used in the experiments contained to a depth of 9.85 in. an average of 2,939.27 lbs. of nitrogen per acre. Each crop of plants grown withdrew about 44.53 lbs. per acre, or 1.6 per cent of the nitrogen supply.

Previous investigations by Wagner and others on the comparative fertilizing effect of nitrate of soda, ammonium sulphate, and lime nitrogen are reviewed. As an average of a large number of pot experiments Wagner concluded that the fertilizing efficiency of lime nitrogen was 90 per cent that of nitrate of soda. In the field experiments here reported a somewhat lower efficiency was obtained. For each 100 parts of nitrogen supplied in form of nitrate of soda oats utilized 64 parts, winter rye 47 parts, barley 58 parts, fodder beets 70 parts; supplied in form of ammonium sulphate oats utilized 59 parts, winter rye 38 parts, barley 48 parts, fodder beets 59 parts; supplied in form of lime nitrogen oats utilized 53 parts, winter rye 41 parts, barley 40 parts, fodder beets 39 parts. The lime nitrogen was found to be particularly beneficial in case of winter crops.

The best methods of applying the different forms of nitrogenous fertilizers on the crops experimented with are discussed. In general it is recommended that top-dressing with nitrogen salts is best done in dry weather after the dew has dried off in the morning. Nitrates should be applied in fine-ground condition. Sulphate of ammonia should not be applied in connection with lime or marl or too soon after the application of these materials to the soil. As a rule ammonium salts should be incorporated with the soil as soon after application as possible.

Fall application of nitrate of soda, J. B. Castelli (*Engrais, 22 (1907), No. 45, pp. 1069, 1070*).—A number of experiments in France and Belgium in which nitrate of soda was applied to wheat in the fall are briefly referred to. They indicate that the practice was beneficial and profitable on a number of different kinds of soil, but more particularly on clay soils.

Experiments with crude ammonia, E. Voglino (*Coltivatore, 53 (1907), No. 47, pp. 651–653*).—Brief reference is made to experiments with corn in which good results were obtained with this material if applied a sufficient length of time (100 days) in advance of planting the crop.

The action of ammonium sulphate on light sandy soils, A. Imelmann (*Deut. Landw. Presse, 34 (1907), No. 91, pp. 719, 720, fig. 1*).—Field experiments on potatoes and rye are reported, which show that ammonium sulphate in connection with Thomas slag, superphosphate, steamed bone meal, and kainit, gave good results on light sandy soils poor in humus, contrary to the general opinion that this fertilizing material is not suited to such soils.

Experiments with lime nitrogen on oats, fodder beets, and potatoes during 1905 and 1906, H. Svoboda (*Ztschr. Landw. Versuchsw. Osterr., 10 (1907), No. 9, pp. 704–711; abs. in Chem. Abs., 2 (1908), No. 6, p. 880*).—No benefit was derived from the use of lime nitrogen in these experiments, the returns from lime-nitrogen plats being as a rule less than from no-nitrogen plats.

Recent experiments with lime nitrogen and other nitrogenous fertilizers (*Zentbl. Agr. Chem., 36 (1907), No. 10, pp. 653–661; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 21, pp. 1153, 1154*).—This is a summary of the results of experiments by Immendorff, Schmoeger, and Strohmer (E. S. R., 19, p. 424), Mach and Hardt (E. S. R., 18, p. 823), Schulze and Kappen (E. S. R., 18, p. 1028), Schneidewind (E. S. R., 18, p. 1029), Wein (E. S. R., 19, p. 19), von Feilitzen (E. S. R., 19, p. 124) and Gerlach, on lime nitrogen, nitrogen lime, and basic lime nitrate (lime niter).

The results of the various investigations generally agree as to the following points: Lime nitrogen is not adapted to acid humus soils nor to light sandy soils, although its action on such soils can be improved by liming or marling. The best results have as a rule been obtained on fine soils rich in lime which have been well manured, and are therefore well stocked with micro-organisms which convert the lime nitrogen first into ammonia and then into nitrates. Applications supplying from 26.72 to 53.44 lbs. of nitrogen per acre applied with a drill or mixed with an equal bulk of earth and thoroughly incorporated with the soil to a considerable depth (as much as 9.85 in.) have given good results when made several days in advance of planting. Some experimenters advise applying the material at least 8 to 14 days before seeding, while others state that no injurious effect is observed if the lime nitrogen is thoroughly and deeply mixed with the soil 3 to 4 days before seeding. It should never be applied as a top dressing, but should be mixed with the soil immediately after application. Its behavior varies greatly with the season and with the crop, but the exact influence of these factors has not yet been fully determined.

Averaging the results of the various experiments reported, the fertilizing effect of the lime nitrogen would appear to be slightly less than that of ammonium salts. The best results reported have been with potatoes, the poorest with sugar beets, with grains occupying the intermediate position.

The results of the experiments generally agree in condemning fall and winter applications of lime nitrogen, although the results in this respect are not entirely concordant. It appears that the changes which the lime nitrogen undergo in the soil are of two kinds, (1) purely chemical, resulting in the formation of dicyanamid, which is decidedly injurious to plants, and (2) bacteriological, resulting in the production first of urea, then ammonia, and finally nitrates. The conditions which are most favorable to nitrification and like bacterial processes in the soil are also most favorable to the most efficient action of lime nitrogen. If lime is deficient or the soil too dry when the lime nitrogen is applied the decomposition may not proceed further than the formation of ammonia, which may be lost into the air. When bacterial action is deficient the chemical processes resulting in the formation of dicyanamid predominate.

The fertilizing principle of nitrogen lime being essentially the same as that of lime nitrogen, the conclusions regarding the latter apply also to the former.

The results obtained with basic lime nitrate (lime niter) generally agree in showing this to be a highly efficient fertilizer free from injurious compounds of any kind and possibly superior to nitrate of soda on soils in need of lime.

The importance of lime as a plant food, K. Brehmer (*Gartenwelt, 12 (1907), No. 2, pp. 15–17, figs. 6*).—The relative growth of Cineraria, Pelargonium, strawberries, oaks, horse-chestnuts, and other plants, on unmanured soil and on soil receiving potash, phosphoric acid, and nitrogen with and without the addition of calcium nitrate (in solution), is described and illustrated in this article. The beneficial effect of the lime was quite marked in most cases, the most pronounced exception to the rule being the horse-chestnut.

The use of manganese as a fertilizer, J. Labergerie (*Semaine Agr. [Paris], 26 (1907), No. 1378, p. 331*).—Experiments with manganese chlorid and sulphate on wheat and *Solanum commersonii* are briefly reported.

In case of wheat on dry sandy soil containing small amounts of lime both the chlorid and the sulphate increased the yield. On a more moist soil the chlorid decreased the yield slightly and the sulphate caused a small increase. In all cases the sulphate was more effective than the chlorid, but both were less effective on wet soil than on dry.

With *S. commersonii* the manganese chlorid produced a slight benefit when used in connection with potassium sulphate, but the effect of the manganese was inappreciable on plats which did not receive potash fertilizers. The manganese salts were applied at the rate of 22.27 lbs. of manganese oxid per acre by dissolving in a considerable volume of water and sprinkling on the soil.

Culture tests of manganese sulphate, M. DE MOLINARI and O. LIGOT (*Bul. Agr. [Brussels], 23 (1907), No. 10, pp. 764–768, fig. 1*).—In view of the experiments of Loew, Bertrand and others (E. S. R., 16, p. 42; 17, p. 954), indicating a considerable fertilizing value for manganese salts, the authors undertook pot experiments with varying amounts of manganese sulphate in connection with other fertilizing materials. The manganese salt was applied to oats grown in pots containing 4 kg. of sand or loam soil at rates of 0.05, 0.1, and 0.15 gm. per pot. The results show that the application of the manganese sulphate produced an appreciable increase in the yield.

On the exploitation of guano, M. M. MAGALLÁNES (*Bol. Soc. Agr. Sur [Chile], 7 (1907), No. 10, pp. 1291–1296*).—The text is given of a decree of the minister of agriculture of October 5, 1907, modifying the original guano concessions.

Information regarding Chincha and Ballesta and neighboring islands, R. E. COKER (*Bol. Min. Fomento [Peru], 5 (1907), No. 6, pp. 76–95, pls. 11*).—A description of these islands with special reference to the origin, nature, and exploitation of their guano deposits is given.

Results and prospects in the nitrate industry (*Economist, 65 (1907), No. 3352, pp. 2029, 2030*).—Statistics are given of the nitrate industry with especial reference to the British trade. It is pointed out that while the conditions are at present unfavorable, "the consumption of nitrate has hitherto kept quite abreast of the production, and though its use as a fertilizer is constantly being threatened by the invention of substitutes, none of these have as yet affected it seriously."

Loss of nitric nitrogen from certain complex fertilizers, ASTRUC (*Semaine Agr. [Paris], 26 (1907), No. 1378, pp. 333, 334*).—This article deals briefly with the loss of nitrogen from mixtures of superphosphate and nitrate of soda. It was found that a mixture consisting of 450 gm. of superphosphate, 300 gm. of nitrate of soda, and 250 gm. of gypsum lost about 11 per cent of its total nitrogen when kept from April 17 to August 15 in a hermetically sealed flask, and this loss was accompanied by a considerable reversion of the soluble phosphoric acid. In lots of the same mixture kept in ordinary bags and paper sacks the loss of nitrogen was three times as great and the reversion of phosphoric acid twice as great as in the sealed flask.

Norwegian nitrogen manufacture, H. H. D. PEIRCE and H. BORDEWICH (*Mo. Consular and Trade Rpts. [U. S.], 1907, No. 326, pp. 227–230; Engin. and Min. Jour., 84 (1907), No. 20, p. 929*).—This is an account of works which have been established in Norway for the production of basic calcium nitrate by the Birkeland and Eyde process. It is stated that the present output is about 1,000 tons per year. New works are being constructed which will increase the output to about 20,000 tons, and others are projected, but further utilization of Norwegian water power for this purpose by foreign capitalists has been practically prohibited by recent legislation of the Norwegian Storthing. "As local capital for such enterprises could hardly be got together in sufficient amounts, the further development of the Norwegian water powers upon a large scale will doubtless be checked for some time."

Process for the manufacture of a fertilizer from the nitrogen of the air, L. ROTH (*Engrais, 22 (1907), No. 49, pp. 1167, 1168*).—The production of ammonia by passing the nitrogen of the air through a mixture of iron, clay, sand, lime, and magnesia heated to 60° C. is briefly noted.

Synthetic nitrogenous compounds, R. McMurtrie (*Amer. Fert., 27 (1907), No. 5, pp. 12-15*).—Various synthetic processes for preparing ammonia and nitric acid as well as the method of preparing calcium cyanamid are reviewed. Investigations of calcium cyanamid by C. Glaser are referred to which showed that the sample of this material with which he experimented contained 1.06 per cent of nitrogen insoluble in water, 1.35 per cent soluble (as pre-formed ammonia), and 15.49 per cent soluble as cyanamid. The material contained 17.89 per cent of available nitrogen as determined by the official permanganate method. This places the availability of the nitrogen higher than that of dried blood or any other of the better forms of organic nitrogen.

On the synthesis of nitrous anhydrid (*Rev. Gén. Sci., 18 (1907), No. 22, pp. 908, 909*).—This is a note on Scarpa's repetition of Helbig's experiments on the oxidation of the nitrogen of liquid air by electrical discharges.

The new nitrogenous fertilizer, calcium cyanamid, E. Crudo (*Torino, 1907, pp. 54; rev. in Rev. Electrochim. et Electrométal., 1 (1907), No. 10, p. 363*).—In this pamphlet the author summarizes information published elsewhere regarding the physical and chemical properties and methods of manufacture of calcium cyanamid. He also reports the results of experiments with the material as a fertilizer.

New complex fertilizers prepared from atmospheric nitrogen, E. and G. Pollaci (*Staz. Sper. Agr. Ital., 40 (1907), No. 6-7, pp. 580-592; abs. in Chem. Zentbl., 1907, II, No. 26, pp. 2072, 2073*).—The authors enumerate certain objections to the use of calcium cyanamid as a fertilizer, namely, (1) the danger of loss of ammonia in storage or in moist soils, (2) the caustic action of the material, (3) injury to germinating seeds, and (4) the generation under certain conditions of acetylene and other poisonous gases. They describe a process patented by them for treating the cyanamid with sulphuric acid by which it is claimed the objections named may be overcome and a more efficient fertilizer obtained.

Treatment of calcium cyanamid with sulphuric acid for use as a fertilizer, E. and G. Pollaci (*Engrais, 22 (1907), No. 49, p. 1171*).—To destroy the caustic and poisonous properties of calcium cyanamid the authors treat the material with a dilute solution of commercial sulphuric acid, 40 to 50° Baumé, in sufficient quantity to render the mixture slightly acid. It is then dried at a low heat (about 40 to 50° C.) and pulverized.

Development of the cyanamid industry in Europe (*Amer. Fert., 27 (1907), No. 5, p. 15*).—This is a list of plants which have been established in Europe for the production of lime nitrogen.

The agricultural importance of the potash deposits of Germany, J. Kühn (*Ber. Physiol. Lab. u. Vers. Anst. Landw. Inst. Halle, 1907, No. 18, pp. 191-197; Illus. Landw. Ztg., 27 (1907), No. 82, pp. 713, 714*).—This is a brief discussion of the economic phases of this subject.

The world's consumption of potash, Maizières (*Engrais, 22 (1907), No. 46, pp. 1092, 1093*).—Statistics of consumption for each year from 1895 to 1906 are given. The total consumption of the world for 1906 is given as 498,000 tons calculated as pure potash (K_2O). Of this total amount the largest consumption (251,333 tons) was in Germany, the next largest (126,000 tons) in the United States.

The world's production of phosphate and superphosphate to the end of 1906, Maizières (*Engrais, 22 (1907), No. 43, pp. 1020-1022*).—The total production of the world during 1906 is given as 4,000,000 metric tons in round numbers. It is estimated that the production for 1907 will exceed this figure by not less than 300,000 tons.

Phosphates and superphosphates, T. Collot (*Jour. Agr. Prat., n. ser., 14 (1907), No. 42, pp. 500-504*).—This is a continuation of previous articles (E.

S. R., 19, p. 524), and discusses in general the superphosphate industry, production in different countries, future development of manufacture, and the supply of mineral phosphates, with especial reference to the requirements and conditions of France.

Fertilizers in Russia (*Oil, Paint and Drug Reporter, 72* (*1907*), *No. 6, p. 47; Ztschr. Angew. Chem., 20* (*1907*), *No. 43, pp. 1876, 1877*).—The hardship and discontent due to high prices of fertilizing materials in Russia are referred to and statistics of the consumption of fertilizers in that country are given. It is stated that Russia at present uses about 112,903 tons of superphosphate annually, of which 80,645 tons is manufactured in Poland, 24,193 tons in Riga, and 8,065 tons in St. Petersburg and Moscow.

Phosphatic deposits of low grade (not more than 8 per cent of phosphoric acid) are found in many parts of Russia, but only in the Government of Podolia are deposits containing as much as 16 per cent of phosphoric acid found.

Fertilizing materials, F. T. Shutt (*Canada Expt. Farms Rpts. 1906, pp. 158–164*).—Analyses of dogfish scrap, tobacco refuse and ashes, wood, limekiln, and muck ashes, and spent bone char are reported and their value as fertilizers briefly discussed. In a number of samples of dogfish fertilizer from reduction works at Canso, N. S., and Shippigan, N. B., the nitrogen varied from 7.59 to 9.41 per cent, the phosphoric acid from 2.9 to 6.49 per cent, the oil from 22.81 to 32.75 per cent. The material was as a rule too coarse and rich in oil to be considered as valuable as a fertilizer as the better forms of fish manures.

AGRICULTURAL BOTANY.

The light requirements of plants, J. Wiesner (*Der Lichtgenuss der Pflanzen. Leipsic, 1907, pp. VII+322, figs. 25*).—This gives the results of prolonged photometric and physiological investigations which were conducted with special reference to the life history, geographical distribution, and cultivation of plants. After describing the various photometric methods for estimating the light requirements of plants, the author discusses the effect of direct and diffused light, the especial light requirements of plants in certain localities, such as tundras, prairies, moors, etc., the varying requirements at different stages of growth, the effect of light on the geographical and altitudinal distribution of plants, the relation of leaf fall to illumination, relation of mycorrhiza to light, shade and etiolation, light and photosynthesis, and other topics.

The production of chlorophyll by plants in different light intensities, W. Lubimenko (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 26, pp. 1347–1349, dgm. 1*).—The author calls attention to the fact that plants begin forming chlorophyll in very diffuse light and states that apparently no effort has been made to quantitatively measure the formation of chlorophyll under varying light intensity. He carried on a series of experiments on about one dozen species of plants, in which the light intensity was varied from daylight to a mere fraction of full illumination.

The author gives the results of his experiments with sunflowers, oats, wheat, and spruce, from which he concludes that the optimum illumination for the production of chlorophyll is considerably below the maximum of light intensity.

The influence of light and moisture on the composition of plants, A. Murinoff (*Ber. Deut. Bot. Gesell., 25* (*1907*), *No. 9, pp. 507–509*).—The tabulated results are given of experiments with *Vicia faba* and wheat grown in light and darkness and in varying amounts of moisture. The length of the internodes, fresh and dry weight, and ash and nitrogen content are given, from which it appears that in general plants grown in the light and also those grown in the more abundant moisture exceed those grown under reversed conditions.

Relative transpiration in cacti, B. E. LIVINGSTON (*Plant World, 10 (1907), No. 5, pp. 110–114, fig. 1*).—The author has studied the curves of relative transpiration for a number of leafy plants and for several forms of cacti. The curves for the leafy plants agree in having uniformly a high period in the day and a low one in the night, while the curves for the cacti exhibit the opposite condition of affairs. Of 26 experiments with 8 species of 3 genera of cacti, 84 per cent were in agreement with the above statement, while the others showing erratic variations were believed to be pathological specimens.

The author states in conclusion that from the observed facts it seems clear that there exists in the cacti a mechanism for governing the rate of water loss, which is entirely different in its response to external conditions or in its daily periodicity from the corresponding mechanism in leafy plants.

The relation of injury to fasciation in the evening primroses, ALICE A. KNOX (*Plant World, 10 (1907), No. 7, pp. 145–151, fig. 1*).—A form of fasciation of the evening primrose due to attacks of a moth is described.

A study of the carbohydrate metabolism in the sugar beet, S. STRAKOSCH (*Ztschr. Ver. Deut. Zuckerindus., 1907, No. 623, II, pp. 1057–1068*).—The author has made a study of the carbohydrates as they appear in the sugar beet and their various transformations. He claims that dextrose is formed in the mesophyll of the leaf blade and that no other kind of sugar is to be found in that part of the leaf. The transfer of dextrose to the veins of the leaf follows the appearance of levulose in the veins. Cane sugar is found in the veins of the leaf after the presence of levulose is noted. The transformation of the monosaccharids to cane sugar in the leaf is dependent upon light, and it ceases immediately when the leaf is placed in darkness. The formation of starch in the chlorophyll grain takes place after the formation of cane sugar and only after there has been a considerable accumulation of carbohydrates in the mesophyll.

The proteases of plants, IV, V, S. H. VINES (*Ann. Bot. [London], 20 (1906), No. 78, pp. 113–122; 22 (1908), No. 85, pp. 103–113*).—In continuation of previous studies (E. S. R., 17, pp. 542, 750) the author gives an account of experiments with seeds.

In the series covered by the first paper the seeds used were those of various species of beans, peas, lupines, and maize. All of the seeds except the lupines were starchy, and it was found that the ungerminated seeds contained a protease that acted immediately on Witte-peptone, and one or more proteases that acted more or less slowly upon the reserve proteids of the seeds; further, that the germinated seeds all contained a protease that digested fibrin and that such a protease in certain cases developed in the substance of the ungerminated seed during the experiment.

In the second series of experiments the author confined his attention to oily seeds, especially those of hemp, but also of mustard, hazel, castor-oil plant, and flax. It was found that oily seeds were much more proteolytically active than starchy seeds. All the oily seeds investigated either contained to begin with, or developed during the experiment, proteases that effected both peptonization and peptolysis, and proved more active than those in starchy seeds. There was found a serious difficulty in comparing seeds, as there was no means of knowing the relative ages of the different samples.

Experiments were conducted on the separation of the proteases, the details of which are given, and the author believes that he succeeded for the first time in isolating from a vegetable tissue a protease that is essentially peptic in its properties. His investigations seem to warrant the conclusion that the hemp seed contains two proteases, one a peptase, the other an ereptase.

The presence of peroxidase in dry seeds, BROCQ-ROUSSEU and E. GAIN (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 25, pp. 1297, 1298*).—A study was made of the seeds of about 45 families of plants, in some cases many genera and species being examined, to determine the presence of peroxidase, or, as the authors designate it, peroxidiastase. The authors found from the examination of a large number of seed that there is generally present a peroxidase in dry seed, but that it does not continue indefinitely in the seed. There appears to be a relation between the age of the seed and the presence of peroxidase, and this is to be investigated further.

The morphogenetic action of certain organic substances on the higher plants, M. MOLLIARD (*Rev. Gén. Bot., 19 (1907), Nos. 222, pp. 241–291, pls 2, figs. 20; 223, pp. 329–349, pl. 1, figs. 20; 224, pp. 357–391, pl. 1, figs. 12*).—Experiments are reported with radish, onion, morning glory, nasturtium, and cress seedlings grown in glucose and other carbohydrates and also in nitrogenous solutions in open and closed tubes, in atmospheres enriched in carbon dioxid, and under various colored screens to determine the effect of these external agencies on the morphology and anatomy of the plants.

The action of the different substances was found to have very characteristic effects on the anatomical structure of the plants. It was found possible to secure a fleshy root development with radishes whenever there was present in the culture medium an available amount of glucose or other carbohydrate equal to the amount normally formed by the plant. Similar results were obtained in the formation of bulbs on the onion seedlings. The flowers in the radish and morning glory were abnormal under the influence of glucose. In the latter flower buds were formed at the first nodes, but they did not develop much further. The production of starch took place when the only source of carbohydrates was from the glucose, levulose, etc., obtained through the roots. In the presence of large amounts of sugars the leaves of the plants underwent profound modifications, approaching in form and structure the cotyledons.

The effect of sugars and other organic substances on the formation and structure of the woody tissues and the distribution of their elements is described at length. The action of asparagin on radishes, especially in closed tubes, showed a marked degeneration in the nuclear structures.

Recent investigations on the rôle of hydrocyanic acid in green plants, II, M. TREUB (*Ann. Jard. Bot. Buitenzorg, 2. ser., 6 (1907), pt. 1, pp. 79–106, pls. 2*).—By reason of the statement of Guignard (E. S. R., 18, p. 126) that hydrocyanic acid is abundant in fallen leaves of elderberry, the author has repeated his investigations and has found that his previous conclusions were confirmed, at least so far as tropical plants are concerned.

The amount of hydrocyanic acid was in general most abundant in the very young leaves, the proportion diminishing as the leaves grew older, and entirely disappearing in many species when the leaves became yellow and were about to fall. Only one species (*Indigofera galegoides*) did not conform to this principle, its leaves retaining practically all their hydrocyanic acid even when fully mature. The diminishing amount of hydrocyanic acid is attributed to a lack of the components yielding that substance and not to the disappearance of the enzyms which act upon the glucosids. In general the more active the leaf the more hydrocyanic acid it will contain.

A description is given of the method adopted by the author for the determination of the hydrocyanic acid occurring in plants and a list presented of 6 genera and 16 species not hitherto reported as containing hydrocyanic acid.

Experiments are described which show the diminution of hydrocyanic acid in plants after a prolonged sojourn in darkness and a gradual increase when again brought into the light. Marked changes were noted after 5 or more days in darkness and when a like period had elapsed after the plants were restored to the light. Investigations with *Pangium edule* showed that light had no part in the formation of hydrocyanic acid, except as it favored photosynthesis. Studies with *Phaseolus lunatus* confirmed this conclusion and showed that carbohydrates and especially dextrose are essential to cyanogenesis, light playing no part in it except as it is necessary for the formation of carbohydrates. The cells that normally produce hydrocyanic acid are formed in darkness, provided the supply of carbohydrates is sufficient. An abnormal fluctuation in the hydrocyanic acid content of leaves of *P. lunatus* and a number of other plants was noted, the maximum occurring about noon.

On the protective influence assigned to hydrocyanic acid in plants, M. Treub (*Ann. Jard. Bot. Buitenzorg, 2. ser., 6 (1907), pt. 1, pp. 107–114, pls. 2*).—As the result of the examination of a number of species of plants, the author denies that the hydrocyanic acid in the plant has in general a protective effect. While some enemies may be warded off by its presence, others seem to be attracted, and the toxicity of the hydrocyanic acid plays no rôle in the economy of the plant.

The rôle of potash in the plant organism, P. Vageler (*Umschau, 12 (1908), No. 1, pp. 5–7, pl. 1*).—The author reviews some of the literature relating to the rôle of potash in the plant organism, pointing out its effect on the assimilative processes, carbohydrate formation, etc. Attention is also called to the undoubted effect a deficiency of potash exerts on the susceptibility of plants to disease.

On nutrient and balanced solutions, W. J. V. Osterhout (*Univ. Cal. Pubs., Bot., 2 (1907), No. 15, pp. 317, 318*).—The author discusses the difference between nutrient and balanced solutions, the difference depending, according to him, on the fact that salts have two distinct functions, namely, nutritive and protective. The protective function is exercised when a poisonous salt has its toxic effect counteracted by the addition of another salt, thus producing a balanced solution. The author notes the balancing effect of strontium, barium, and calcium on the poisonous properties of magnesium, sodium, and potassium. It is stated that a nutrient solution may serve its purpose very well so long as used in a very dilute form, but if the concentration is increased there is soon reached a point where toxic effects intervene, and these must be counteracted by the addition of suitable protective salts. When this is done a balanced solution is obtained.

The author shows that while, according to the researches of Pasteur, Raulin, and others, calcium is not needed for the nutrition of fungi, yet when the concentration of the solution is increased so that it becomes toxic, the addition of calcium has a protective value for fungi just as for other plants.

Culture of micro-organisms, E. Küster (*Kultur der Mikroorganismen. Leipsic and Berlin, 1907, pp. 11+201, figs. 16*).—This book is presented as a guide to the culture of micro-organisms and is intended for use in zoological, botanical, medical, and agricultural laboratories. After describing in general the methods to be pursued, the author takes up a discussion of nutrient media and their preparation and the making of cultures, after which special directions are given for the cultivation of protozoa, flagellata, myxomycetes, algæ, fungi, and bacteria.

On the importance of pure cultures, O. Richter (*Die Bedeutung der Reinkultur. Berlin, 1907, pp. VIII+128, figs. 3*).—In this work, which is a literature study, the author points out the necessity for pure cultures of micro-organisms in carrying on physiological and other studies.

FIELD CROPS.

Sandy soils and their improvement in the growing of forage crops, E. B. Voorhees and J. G. Lipman (*New Jersey Stas. Bul. 211, pp. 30*).—This bulletin reports the results of experiments with forage crops suited to the improvement of very light and open soils. Yields are reported for the years 1904 to 1907, inclusive. Two crops were harvested annually, except in 1904, when only one crop was secured. One acre of land divided into 5 plats was devoted to this work. The soil, fairly uniform in character, was distinctly sandy with a large proportion of fine sand. In preparing the land for these experiments 1,000 lbs. of lime, 320 lbs. of acid phosphate, 100 lbs. of ground bone, 160 lbs. muriate of potash, and 150 lbs. of dried blood were applied per acre. Plats 1, 4, and 5 received each in addition a top dressing of nitrate of soda at the rate of 80 lbs. per acre after the plants were well started.

The nonleguminous crops grown were corn, wheat, rye, millet, beets and mangels, and wheat, oats or rye, with vetch. The leguminous crops for the 4 years included 5 of crimson clover, 4 of cowpeas, 3 of soy beans, 6 of vetch grown alone or with rye, wheat or oats, and 1 crop each of red clover and alfalfa. Crimson clover, cowpeas, and vetch made good growth and proved well adapted to producing forage as well as increasing the humus and nitrogen supply of the soil. The frequent growing of leguminous crops increased the protein production and fixed large amounts of atmospheric nitrogen, part of which was added to the soil. It is stated that with a plant food supply of phosphoric acid, potash, and lime the protein in the forage and the nitrogen for the soil is secured at a comparatively slight expense.

Although no effort was made in these experiments to establish a complete soiling system, succulent forage was available for a considerable portion of the growing season. The returns from the lands showed a gradual and marked increase. The value of the crops of the different plats is shown in the following table:

Value of forage crops less cost of the fertilizers.

Plat.	1904.	1905.	1906.	1907.
1	$27.76	$40.40	$74.48	$76.20
2	18.48	73.20	83.09	101.77
3	----------	57.49	80.19	84.12
4	32.48	45.20	17.20	101.69
5	21.35	18.32	65.40	20.71

The value of the crops in excess of the cost of the fertilizers shows total average gains per acre of $20.01 in 1904, $46.92 in 1905, $64.07 in 1906, and $76.90 in 1907.

The bulletin discusses the general character of light soils, the physical, chemical, and bacteriological properties of sandy soils, and the relation of this class of soils to lime.

The influence of leguminous crops in rotations upon the yield of cereals, A. Bytchikhine (*Povuishenie Urozhaya Khlycbov v Mnogolol'no-travyanom Syevooborot s Svyazi s Obschchei Produktivnost'yu Bobovuikk Trav. Odessa, 1907, pp. 70, pls. 3, figs. 8*).—The results of rotation experiments at Ploti showed that winter wheat sown on April fallow and spring wheat, the second and third crops, respectively, after a leguminous crop, produced the highest absolute difference in yield among the crops in the rotation. In a 9-year rotation it was observed that the roots of sugar beets showed a marked increase in size when the crop was grown after cereals. Corn and sugar beets were apparently least influenced by a preceding leguminous crop. The grain crops produced better yields when grown after sainfoin than when following alfalfa. The average difference in favor of sainfoin in the yield of 6 different crops was 115.4 kg. per hectare.

Permanent pastures: Their importance, establishment, and management, with special reference to intensive production, F. Falke (*Die Dauerweiden, Bedeutung, Anlage und Betrieb derselben unter besonderer Berücksichtigung intensiver Wirtschaftsverhältnisse. Hanover, Germany, 1907, pp. IX + 284*).—This book devotes a chapter each to the general importance of pasturage, the establishment of pastures, their management, and their associate and cooperative ownership or control.

The botanical and chemical composition of the herbage of pastures and meadows, S. F. Armstrong (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 283–304*).—Investigations were conducted which showed that on the best grazing lands in the English midlands white clover and rye grass formed the greater part of the herbage, while *Cynosurus cristatus*, *Agrostis stolonifera*, and *Poa trivialis* are the next most abundant species. On the inferior types of grass land in the same region the herbage consisted very largely of *A. vulgaris*. *Dactylis glomerata* and *Festuca ovina* are sometimes abundant on the better meadows, and *Holcus lanatus* and *Deschampsia cæspitosa* on the poorer ones.

The choicest grazing lands were found invariably associated with soils rich in available phosphates. On suitable soils for permanent pasture poor herbage was generally due to the lack of available phosphates or to the poor mechanical condition of the soil. It was also shown that the herbage of the best grazing lands may be twice as rich in nitrogen and phosphate as that of poor pasture, and that this condition is apparently directly determined chiefly by the proportion of white clover and indirectly by the percentage of available phosphates in the soil.

On new pastures from 3,000,000 to 4,000,000 individual plants were counted per acre. On old pastures the number was not readily determined with accuracy, but it is believed that it is much smaller than is usually supposed.

Field experiments with farm crops, W. Saunders, J. H. Grisdale, W. T. Macoun, F. T. Shutt, C. E. Saunders, R. Robertson, N. Wolverton, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1906, pp. 5–45, 82–95, 128–133, 175, 176, 235–256, 277–292, 303–320, 337–357, 379–388, pls. 4*).—Reports are presented on the work with field crops at the Canada experimental farms in 1906. Most of the lines of work discussed have been previously reported (E. S. R., 18, p. 129).

Wheat.—Results of a fertilizer experiment with wheat in progress for 19 years show that in 1906, of the 21 plats differently treated the plat receiving each year from 1888 to 1897 6 tons of barnyard manure, partly rotted and actively fermenting, mixed with 500 lbs. of untreated and finely ground mineral phosphate and allowed to heat several days before using, in 1898 500 lbs. of Thomas phosphate in place of the mineral phosphate, no fertilizers from 1899 to 1905, and with the same application in 1906 as in 1898, stood first in yield with 28 bu. 20 lbs. per acre. The plat receiving 12 tons of well-rotted barnyard manure in 1888, 15 tons per acre each year thereafter to 1898 inclusive, no manure from 1899 to 1905, and 15 tons per acre in 1905–6 ranked second with a yield of 23 bu. 50 lbs. per acre. This plat also stood second in the average yield per acre for 19 years with 22 bu. 36 lbs. The plat treated exactly like the one just mentioned, but receiving fresh manure instead of well-rotted, stood first in average yield for the 19 years with 22 bu. 46 lbs. per acre. The plats unmanured from the beginning gave an average yield of about 11 bu. per acre for the 19 years.

The results on the uniform test plats in 1906 show that among 37 varieties of spring wheat, Bishop, Ebert Selected, and Colorado headed the list in productiveness with yields of 41 bu. 40 lbs., 40 bu. 20 lbs., and 40 bu. per acre, respectively. Of the list of varieties entering into this test, 23 represented varieties and selected strains produced at the Central experimental farm, Ottawa. Aurora and Ebert Selected were the earliest of the most productive sorts, ripening August 1 and 2, respectively. Among 12 varieties of durum wheat under test Roumanian headed the list this year with 41 bu. per acre. This variety has also given the largest average yield during the past 5 years. Winter wheat was sown August 29, 1905, but only one variety, Padi, proved satisfactory. This variety ripened on July 23 and yielded at the rate of 40 bu. 40 lbs. per acre.

At the Nova Scotia farm at Nappan 16 varieties of spring wheat were compared this year and the leading varieties were Red Fern, Red Fife, Bishop, and White Fife, the yields being 34 bu., 33 bu. 20 lbs., 32 bu. 40 lbs., and 32 bu. per acre, respectively. At this farm Goose durum wheat yielded per acre 22 bu. 40 lbs., while Roumanian yielded 22 bu.

At Brandon, where 16 varieties of spring wheat were tested, Preston stood first in yield per acre with 44 bu., followed by Huron with 43 bu. 50 lbs., Pringle Champlain with 41 bu. 50 lbs., and Red Fife with 40 bu. per acre. Among 4 varieties of durum wheat, Goose was the leader with 56 bu. 20 lbs. per acre.

The results of a fertilizer test show that the plat receiving 200 lbs. per acre of muriate of potash, spread just before sowing the wheat, produced 39 bu. 20 lbs. per acre, this being the highest yield in the series, while the plat receiving no fertilizer produced 32 bu. 40 lbs. The use of 200 lbs. per acre of nitrate of soda, half applied when the grain was 2 in. high and the rest when it was 6 in. high, was apparently without effect. Smutty seed wheat treated with formalin and bluestone produced yields ranging from 31 bu. 10 lbs. to 34 bu., while the same kind of wheat not treated yielded 19 bu. 30 lbs.

On the Saskatchewan farm at Indian Head the most productive among 22 varieties of spring wheat were White Fife, Preston, and Stanley, the yields being 48 bu. 40 lbs. 46 bu., and 45 bu. 20 lbs., respectively. Of the varieties compared 15 yielded 41 bu. per acre or more. In a fertilizer test the plat receiving 200 lbs. of muriate of potash per acre ranked first in yield with 48 bu. 40 lbs., the unfertilized plat producing 35 bu. 20 lbs. per acre. Among the durum wheats, Yellow Gharnovka stood first with 52 bu. 40 lbs. per acre, followed by Goose with 1 bu. less.

Spelt and emmer.—At the Central experimental farm, the yields of 11 varieties of emmer and spelt ranged from 600 to 2,720 lbs. per acre. The best yielding varieties were Common, Red, and Double emmer, the Red and Double producing 2,680 and 2,540 lbs. of grain per acre, respectively. Two varieties of spelt and two of emmer were grown at Nappan. White and Red spelt led in yield with 2,120 and 1,880 lbs. per acre, respectively. Common emmer and Red spelt produced the best results at Brandon, the yields per acre, respectively, being 3,820 and 3,180 lbs. At Indian Head, Red spelt produced 3,600 lbs. per acre and Common emmer 3,220 lbs. per acre, these two being the best yielding among 5 varieties.

Oats.—The results of experiments with fertilizers on plats of oats at the Central experimental farm show that the best average yields for 18 years were secured on the barnyard manure plats, the one receiving the fresh manure yielding 56 bu. per acre, and the one receiving the well-rotted manure yielding 52 bu. 11 lbs. per acre. The fresh manure plat also ranked first in 1906 with 53 bu. 8 lbs., while the well-rotted manure plat stood third, having produced, however, only 10 lbs. less of grain than the plat treated with mineral phosphate and nitrate of soda. The results of the variety test show that the yields this year of 59 varieties ranged from 27 bu. 2 lbs. to 74 bu. 24 lbs. per acre. The leading varieties mentioned in the order of decreasing yield were Gold Rain, Thousand Dollar, Fichtel Mountain, Irish Victor, and Joanette, all yielding over 70 bu. Nine of the varieties grown were produced at the Central experimental farm. Sixty-day stands first in earliness, ripening in 1906 in 81 days from the time of sowing. Tartar King, Welcome, and Daubeney are not quite so early but generally more productive.

Of 37 varieties compared at Nappan, 13 produced 50 bu. or more, and the leading variety, Goldfinder, gave a yield of 63 bu. 18 lbs., being the only one yielding over 60 bu.

On the Manitoba farm at Brandon, the 40 varieties tested ranged in yield from 69 bu. 14 lbs. to 116 bu. 16 lbs. Fifteen varieties yielded 100 bu. or more per acre. Following American Beauty, which stood first, Banner produced 114 bu. 4 lbs., Improved American 110 bu. 20 lbs., Mennonite 110 bu. 20 lbs., Tartar King 110 bu., and White Giant 110 bu. per acre. The heaviest variety, Virginia White, weighed 41¼ lbs. per measured bushel after cleaning. It was observed in another test that oats grown after peas gave better yields than when grown after various other crops.

On the Saskatchewan farm, where 39 varieties were tested, the range in yield was from 78 bu. 8 lbs. to 128 bu. 28 lbs. Banner was the leading variety, and following this Bavarian gave a yield of 124 bu. 4 lbs. and Improved Ligowo 122 bu. 32 lbs. per acre. The yield per acre of 27 varieties was 100 bu. or over. Among a number of varieties grown in field plats Banner also stood first, yielding 87 bu. 21 lbs. per acre on a field of 11¼ acres. In a 4-year comparison on field plats Banner heads the list with 99 bu. 32 lbs.

At Agassiz, B. C., 37 varieties of oats were grown on test plats. The leading varieties and their yields per acre were as follows: Olive Black 72 bu. 32 lbs., Lincoln 72 bu. 12 lbs., Goldfinder 71 bu. 26 lbs., Virginia White 71 bu. 26 lbs., Black Beauty 71 bu. 16 lbs., and American Beauty 70 bu. 20 lbs.

Barley.—In average yield for 18 years in the fertilizer experiments with barley the barnyard manure plats ranked first and were practically equally productive, the yields being 37 bu. 38 lbs. for the well-rotted manure plat and 37 bu. 47 lbs. for the fresh manure plat. For the year 1906 the fresh manure plat stood first with 53 bu. 16 lbs., followed by the plat receiving mineral phosphate, nitrate of soda, and unleached wood ashes with 51 bu. 2 lbs. The well-rotted manure plat yielded 49 bu. 18 lbs. in 1906, while the check plat yielded 28 bu. 16 lbs. this season and had an average production of 15 bu. 38 lbs. for the 18 years.

At Ottawa, 27 varieties of 6-rowed and 28 varieties of 2-rowed barley were compared. Among the 6-rowed varieties Albert stood first with 77 bu. 4 lbs., Black Japan second with 72 bu. 44 lbs., and Mandscheuri third with 70 bu. per acre, while among the 2-rowed sorts Hanchen ranked first with 75 bu., Standwell second with 67 bu. 44 lbs., and Erfurt White third with 66 bu. 32 lbs. Mensury, Odessa, Nugent, Trooper, and Blue Long Head are considered the most productive varieties of 6-rowed barley tested for several years, while Mensury and Odessa are also among the earliest sorts. The varieties mentioned as most productive among the 2-rowed sorts are French Chevalier, Danish Chevalier, Canadian Thorpe, Princess Svalöf, and Standwell. Beaver and Jarvis are the earliest sorts, ripening 2 or 3 days before French Chevalier. Winter barley was killed out.

On the Manitoba farm at Brandon, 18 6-rowed varieties and 14 2-rowed varieties were compared. The leading 6-rowed varieties were Blue Long Head, yielding per acre 66 bu. 42 lbs., Nugent 65 bu. 40 lbs., Mensury 61 bu. 12 lbs., Odessa 60 bu. 40 lbs., and Yale 60 bu. 10 lbs per acre. Among the 2-rowed sorts Jarvis ranked first, yielding 66 bu. 22 lbs., followed by French Chevalier with 61 bu. 2 lbs., and Clifford with 60 bu. 30 lbs. Barley after millet produced a better yield of grain than when grown after wheat, oats, peas, or on a summer fallow.

On the Indian Head farm, among 14 varieties of 2-rowed barley Danish Chevalier led with a yield of 60 bu. per acre, followed by Sidney with 54 bu. 2 lbs., Jarvis with 52 bu. 44 lbs., and Clifford, Gordon, Invincible, and Standwell, each yielding 52 bu. 24 lbs. per acre. Among 18 6-rowed varieties, Odessa, producing the highest yield, gave 65 bu. 40 lbs., Blue Long Head 64 bu. 8 lbs., and Common 60 bu. 40 lbs. per acre. In field lots of several acres in size the two leading varieties were Claude and Odessa, the yields per acre, respectively, being 58 bu. 28 lbs. and 57 bu. 7 lbs. These two varieties also ranked first in a 4-year comparison of field crops, the average yield per acre in this case being 62 bu. 30 lbs. and 58 bu. 40 lbs., respectively.

The barley experiments at Agassiz, B. C., included tests with 18 varieties of 6-rowed and 14 varieties of 2-rowed barley. The leading 6-rowed varieties and their yields were as follows: Mensury 49 bu. 28 lbs., Odessa 47 bu. 4 lbs., and Empire 46 bu. 32 lbs., and the leading varieties of the 2-rowed sorts were Clifford, with a yield of 46 bu. 32 lbs., Swedish Chevalier with 42 bu. 14 lbs., French Chevalier 41 bu. 42 lbs., Dunham 41 bu. 32 lbs., Danish Chevalier 41 bu. 12 lbs., and Sidney 41 bu. 2 lbs. per acre.

Rye.—Common spring rye at Ottawa produced a yield of 40 bu. 20 lbs., as compared with 39 bu. 16 lbs. yielded by Ottawa Select, a new strain produced at this farm by selection. The yields of winter rye varieties were as follows: Thousandfold 48 bu. 32 lbs., Mammoth White 43 bu. 52 lbs., and Dominion 43 bu. 32 lbs. At Indian Head winter rye sown September 13, 1905, was ripe August 7, produced straw 65 in. long including the head, and yielded 44 bu. of grain per acre, while spring rye sown April 11, was ripe August 16, produced straw 48¾ in. long, and yielded 35 bu. 20 lbs. per acre.

Corn.—In the fertilizer experiments with corn the largest average yield for 15 years for the late-maturing variety, 16 tons, 750 lbs. per acre, was secured on the well-rotted manure plat. The plat ranking next in yield, with 15 tons, 1,979 lbs. per acre received 350 lbs. of mineral phosphate, 200 lbs. of nitrate of soda, and 1,500 lbs. of unleached wood ashes per acre in 1898–9, no fertilizers from 1900 to 1905, and the application first mentioned in 1905–6. The yields on the fresh barnyard manure plat and on the plat receiving barnyard manure together with mineral phosphates were but very little smaller and the yield ranked second. The best average yield of the early-maturing variety, 13 tons, 320 lbs. per acre was also secured on the well-rotted barnyard manure plat, and the plat ranking next with 12 tons, 808 lbs. per acre corresponded to the one standing second in the test with the later-maturing corn.

The leading varieties of corn at Ottawa were Wood Northern White Dent, Early Mastodon, Early Butler, and Selected Leaming. The yields of 23 varieties ranged from 7 tons, 190 lbs. to 15 tons, 690 lbs. when drilled in rows 35 in. apart, and from 9 tons, 1,140 lbs. to 16 tons, 450 lbs. when grown in hills 35 in. apart each way. The hills produced an average yield of 1 ton, 803 lbs. greater than the rows. In growing corn in rows 21, 28, 35, and 42 in. apart the largest yield was obtained from the rows closest together.

At the Nova Scotia farm, Early Mastodon and Thoroughbred White Flint ranked first, with yields of over 25 tons per acre when grown in rows, while North Dakota White and Cloud Early Yellow stood second with 20 tons, 1,470 lbs. and 20 tons, 150 lbs. per acre, respectively, when the corn was grown in hills. In field experiments with corn at this farm the use of 300 lbs. of commercial fertilizer in addition to 20 loads of barnyard manure resulted in a loss.

At the Manitoba farm the 3 leading varieties, Thoroughbred White Flint, Champion White Pearl, and Longfellow each yielded over 21 tons per acre when grown in rows, but when grown in hills only Thoroughbred White Flint retained its rank, with 23 tons, 464 lbs. per acre, the next best yielding varieties being Superior Fodder, Early Butler, and Red Cob Ensilage. At this farm fodder corn planted in rows 30 in. apart gave the heaviest yield.

At Indian Head, in the tests with the corn drilled in rows, Eureka ranked first with a yield of 16 tons, 1,000 lbs. per acre, followed by Thoroughbred White Flint, Pride of the North, Angel of Midnight, and Champion White Pearl, all yielding over 15 tons. Eureka also retained its rank on the plats where the corn was grown in hills, the yield being 17 tons, 980 lbs. per acre, being followed by Angel of Midnight with 15 tons, 800 lbs.

On the British Columbia farm, Pride of the North ranked first in yield under both methods of planting, the corn grown in drills yielding 24 tons, 1,280 lbs., and the corn grown in hills 23 tons, 1,300 lbs. Red Cob Ensilage and Giant Prolific Ensilage, which ranked next in the drill corn tests, yielded 20 tons, 1,580 lbs., and 20 tons, 40 lbs. per acre, respectively.

Miscellaneous.—The results of variety tests with peas, potatoes, sugar beets, flax, buckwheat, root crops, grasses, and other forage crops at the different farms are also reported. In a series of rotation experiments in progress at Ottawa the largest profit per acre in 1906, $8.13, was secured on the land under a 5-year rotation with clover hay, timothy hay, grain, corn, and grain.

Results obtained in 1907 from trial plats of grain, fodder corn, field roots, and potatoes, W. and C. E. SAUNDERS (*Canada Cent. Expt. Farm Bul. 58, pp. 43*).—The results secured in 1907 in variety tests conducted at the Canada experimental farms with different field crops are given in tabular form with brief general notes. The reports of earlier years have been previously noted (E. S. R., 18, p. 828). The testing of different varieties on uniform trial plats has now been in progress for 13 years. The tables given show the varieties in the order of their average yield for the last 5 years.

Fertilizer tests with wheat and corn, H. SNYDER (*Minnesota Sta. Bul. 102, pp. 1–23, figs. 2, map 1*).—Directions are given for making fertilizer tests with wheat, and the results of 19 series of cooperative experiments in different parts of the State are reported. In 11 tests an increase of from 2½ to 9 bu. per acre was apparently secured from the use of 320 lbs. per acre of an acid phosphate fertilizer costing $2.56. In 10 of the tests muriate of potash applied at the rate of 160 lbs. per acre and costing $4 gave an increase. In 4 cases the increase in yield from the use of potash was 5 bu. or more. Nitrate of soda used singly gave a noticeable increase only in 2 cases. A complete fertilizer applied at the rate of 600 lbs. per acre gave an increase of 2 to 9 bu. in 11 of the trials, but in no case was the increase sufficient to pay the cost of the fertilizer, which amounted to $8.40. In 6 of the 11 tests approximately the same increase was secured from the use of the phosphates alone, and in 4 of the 11 trials the increase was secured from the potash alone, costing less than half as much as the complete fertilizer.

The results of 8 series of experiments with corn showed that the use of commercial fertilizers for this crop was not profitable.

It is stated that on old wheat lands potash fertilizers can be used to better advantage than either nitrogen alone or a complete fertilizer. The conclusion is drawn that commercial fertilizers when used in connection with crop rotation, farm manures, and clover production are much more profitable than when used as the only means of increasing fertility.

The seeding, growing, and curing of alfalfa, R. A. Moore (*Wisconsin Sta. Special Bul., pp. 12, figs. 6*).—This bulletin contains general directions for alfalfa culture.

Type and variability in corn, E. Davenport and H. L. Rietz (*Illinois Sta. Bul. 119, pp. 38, figs. 3*).—This bulletin outlines and defines type and variability as factors in corn breeding, and presents certain data showing conditions that influence type and variability in corn.

It is pointed out that the three conceptions of type which should rest in the corn breeder's mind are the ideal or standard for selection which is attained by few individuals or perhaps none, the mode or prevailing type as represented by the highest proportion of what the breeder actually produces, and the mean or average of all the breeder produces. Variability is defined as deviation from type and is considered as best indicated by the standard deviation in mathematical expression involving the deviation of every individual. Variability may be reckoned from the mean, the mode, the selection standard, or any other desired basis. The coefficient of variability is a purely abstract expression for variability, so that by its means the variability of one character may be compared with that of another either in the same or different races.

The shifting of the type without greatly reducing variability is considered the effect of selection. It is stated that each character of every race has a natural variability which can not be greatly reduced by selection, and that the indirect effect of selection is to influence physical or other characters correlated with those selected. So far as length, circumference, and weight are concerned the type of ear is directly affected by fertility, but this factor does not affect the number of rows in the ear. It has been found that variability is slightly less on fertile lands than on lands giving lower yields.

The subject of type and variability in general is treated in this bulletin by the statistical method, now everywhere employed, for the study of the more complicated questions of variation and heredity, and a graphic representation of this method concludes the bulletin.

Studies of Egyptian cotton, W. L. Balls (*Yearbook Khediv. Agr. Soc. Cairo, 1906, pp. 29–89, pls. 12*).—Some of the cotton problems of Egypt are pointed out and notes on heredity in cotton are given. Experiments in cotton breeding are reported. Texas Wool cotton was crossed with Abbassi, Hindi with Hindi hybrid, Afifi with Truitt Big Boll, Hindi with Charara, and Charara with Moqui, the female parent in each one of these pairs being mentioned first.

The author concludes from a comparison of the results that there are probably allelomorphic pairs of characters in cotton hybrids, which exhibit complete dominance and recession in the heterozygote. The allelomorphic pairs for the seed characters were as follows:

Dominant:	Recessive:
Long staple.	Short staple.
Regular distribution.	Irregular distribution.
Regular length.	Irregular length.
Colored lint.	White lint.
Silky lint.	Harsh lint.
More fuzz.	Less fuzz.

Cotton futures and their influence on the cotton industry, H. Heizmann (*Das Baumwoll-Termingeschäft und dessen Einfluss auf die Baumwoll-Industrie. Inaug. Diss. Univ. Zurich, 1907, pp. XV+129*).—This publication is the fifth in a series treating of cotton in its commercial aspects. The different parts are devoted to the investigation of the cause of low cotton prices from 1892 to 1895, the organization of cotton spinners' associations in different States, the first international cotton congress at Zurich, and the economic and legal aspects of dealing in cotton futures. A bibliography of the literature consulted in the study of these subjects is given.

Irish potato fertilizer experiments, W. S. Hotchkiss and E. J. Kyle (*Texas Sta. Bul. 101, pp. 11*).—The experiments here reported were carried on for 4 years.

The total results show that the use of nitrogen either in the form of cotton-seed meal or nitrate of soda was very beneficial. When used in a complete fertilizer very little difference in effectiveness between the nitrate of soda and cotton-seed meal was observable. The apparent average increase resulting from nitrogen amounted to 21 bu. per acre.

The average increase in yield due to the use of acid phosphate exceeded 23 bu. per acre. The results show that when nitrogen and phosphoric acid were used together the yield was as high as on the plats receiving varying amounts of nitrogen and phosphoric acid combined with potash. On the average for the 4 years the plats fertilized with nitrogen and phosphoric acid yielded about 20 bu. per acre more than the plats receiving nitrogen only. There was practically no difference in the yield between the plats receiving acid phosphate and those receiving acid phosphate and potash. During the 4 years potash gave comparatively negative results.

With these results as a basis the authors recommend for all sandy East Texas soils the following application of fertilizers: 1,000 lbs. of 14 per cent acid phosphate, 700 lbs. of cotton-seed meal, 200 lbs. of kainit, and 100 lbs. of nitrate of soda.

Rice, R. J. Nelson (*Arkansas Sta. Bul. 98, pp. 133–148, figs. 4*).—This bulletin contains notes on the rice crop of Arkansas in 1907, a report on a test of pumping plants, and suggestions to prospective planters.

The crop grown at the station in 1907 required 127.14 days to mature, the season for Honduras rice being 131.25 days and for Japan rice 121.66 days. The average irrigation season was 81 days. The rice was sown at the rate of 1½ to 1¾ bu. per acre. The drill was found unsatisfactory for sowing rice. The use of fertilizers apparently hastened the time of maturity.

Comparative tests of violet Solanum commersonii and Giant Blue, Early Rose, and Magnum Bonum potatoes, E. Lemée (*Bul. Acad. Internat. Géogr. Bot., 3. ser., 17 (1908), No. 219, pp. IV–VI*).—In these observations, conducted in 1907, the largest yield of the 4 varieties studied was produced by Magnum Bonum. Small seed tubers of violet *Solanum commersonii* produced larger sized tubers than larger seed. Violet *S. commersonii* also proved to be more productive than the Giant Blue potato.

Cooperative experiments with winter spelt, C. Fruwirth (*Württemb. Wchnbl. Landw., 1907, No. 47, pp. 809–815*).—Cooperative experiments with different kinds of winter spelt were conducted in regions of low and high altitude. Red Tyrol spelt gave best results at the higher altitudes, while Stoll Brown Meckesheim was best adapted to the lowland sections, giving higher yields of grain and straw than the red varieties. Soaking the seed in copper-sulphate solution or similar treatment is considered necessary in successful spelt culture.

Tobacco growing in the Philippines, G. E. Nesom (*Philippine Bur. Agr. Farmers' Bul. 15, pp. 13*).—This bulletin presents in a popular manner information and advice regarding the culture of tobacco in the Philippine Islands.

Influence of fertilizers upon the composition and quality of wheat, H. Snyder (*Minnesota Sta. Bul. 102, pp. 24–34, figs. 2*).—A study of the influence of fertilizers upon the weight per bushel of wheat and the character of the kernels is reported. It was observed that nitrogen used alone retarded maturity, while minerals used alone hastened it. Where a large increase in yield was secured through the use of fertilizers the kernels were generally larger, better filled, and better colored than those grown under less favorable fertilizer conditions. In 8 trials the phosphate fertilizer increased the weight of the grain per bushel and in 2 the weight was the same as when no fertilizer was used. In 5 trials potash increased the weight per bushel, and in no case was it decreased by the use of this element. Nitrogen increased the weight in some cases and decreased it in others. The weight per bushel, character of the kernel, chemical composition of the grain, and results of bread making and technical tests of the flour are given in tables and discussed.

Forty-one samples of flour from wheat grown upon fertilized and unfertilized plats at 9 different places were examined. From 3 of the 9 places the wheat grown on plats fertilized with phosphates produced flour that made the best bread, from 2 places the wheat fertilized with nitrogen, from 2 the wheat fertilized with potash, and from 2 the wheat receiving a complete fertilizer. In 30 tests the fertilizers which gave the largest yields produced wheats of the highest bread-making value, while in 10 the best quality of flour was secured from the fertilized wheats not showing the largest yield per acre. While yield and bread-making quality were both improved by the use of fertilizers, they were not improved to the same extent by the same fertilizer. No constant relationship between the percentage of protein in the grain and flour and the bread-making value was apparent, and while it is considered possible to increase the amount of proteids in flour by the use of nitrogenous fertilizers it is stated that the bread-making value is not proportionately increased. The increase in nitrogen content in some instances imparts a negative value as a part of the nitrogen is in nonproteid forms. The results as a whole are taken as showing that not only the yield of wheat but also the bread-making value can be enhanced by increasing the soil fertility and that a very close relationship exists between the amount of available plant food in the soil and the quality and bread-making value of the wheat produced on it.

The adulteration and misbranding of alfalfa, red clover, and grass seeds, B. T. GALLOWAY (*U. S. Dept. Agr., Office Sec. Circ. 26, pp. 6*).—Samples of seed of red clover, alfalfa, meadow fescue, *Bromus inermis*, and Kentucky bluegrass were examined and the results are here briefly reported.

Of 1,217 samples of red clover seed 405 contained seed of dodder, 424 traces of yellow trefoil seed, and 135 bore evidence of having originated in Chile. Of 390 samples of alfalfa seed 191 contained seed of dodder, 135 a trace of yellow trefoil seed, 120 a trace of sweet clover seed, and 16 a trace of bur clover seed. Of meadow fescue only 64 samples were obtained, of which 20 contained chess in amounts varying from a trace to more than 19 per cent, 4 contained seed of rye grass, and 6 were misbranded, 4 being Canada bluegrass, 1 orchard grass, and 1 a mixture of orchard grass and fescue. Of 55 samples of *Bromus inermis* seed 15 contained seed of cheat, 28 from 2 to 3 per cent of seed of the wheat grasses, several seed of meadow fescue, and 1 more than 24 per cent of meadow fescue and rye grass seed together. Of 429 samples of Kentucky bluegrass seed secured, only 8 were free of any trace of Canada bluegrass.

In most of the samples the trace of Canada bluegrass found was immature seed, showing that it was harvested with the Kentucky bluegrass seed. In 110 samples, however, Canada bluegrass seed was found in quantities exceeding 5 per cent, 32 of these being Canada bluegrass seed misbranded as Kentucky bluegrass seed.

References to recent work in plant breeding, C. FRUWIRTH (*Jour. Landw., 55 (1907), No. 4, pp. 339–354*).—References are given to 40 articles and publications reporting work in plant breeding or discussing this subject.

HORTICULTURE.

Horticultural work at the Canada experiment stations, W. T. MACOUN, R. ROBERTSON, N. WOLVERTON, A. MACKAY, and T. A. SHARPE (*Canada Expt. Farms Rpts. 1906, pp. 97–121, 126–128, 133–147, 298–301, 324–333, 357–370, 389–406, pls. 2*).—The usual annual report on culture experiments and variety tests with a large number of orchard and small fruits, vegetables, flowers, shrubs, and trees grown on the different experimental farms in Canada, together with considerable general information relating to work at each of the stations. The data are similar in nature to those reported in previous years (E. S. R., 18, 140).

At the Central farm, W. T. Macoun reports the effect of the unusual winter of 1905–6 as very marked on vegetation. Practically all strawberry plants in that vicinity were destroyed even when well mulched. Considerable damage is also reported to herbaceous perennials, deciduous trees, and shrubs, including fruit trees and bushes. Forty-seven seedling varieties of apples and 1 seedling pear were received for examination in 1906. Full descriptions are given of the most promising varieties, with briefer notes on those of no especial merit. Out of 3,000 seedling apples of Russian origin planted out in 1890 and gradually reduced to 75 and tested in the prairie provinces for hardiness and size, 59 have been considered sufficiently promising to name. Thus far only 4 compare favorably with the best named varieties of their season. Two thousand seedlings originating from the best named varieties fruited at Ottawa have been planted out since 1901. One hundred and five of these seedlings fruited in 1906, some of which it is believed are superior to some of the named sorts of the same season. Descriptions are given of a large number of the most promising seedlings and cross-bred apples fruited at the station, including 4 crosses of McMahan with Scott Winter produced by J. Craig.

The conclusions reached after 19 years' experience and search for a hardy winter apple of good appearance and best quality are given. Briefly summarized, it is stated that the hardiest apples are those which have originated in Russia. Varieties originating in milder climates have proved more tender. Summer and autumn varieties are hardier than later-keeping sorts. The majority of winter apples which have thus far been produced are not apt to prove hardy in the colder apple districts of Canada because the trees, having originated where the season is longer, grow too late for the short season in those districts. The basis for the production of the desired winter apple for the North is believed to be in varieties which have withstood test winters in the North, and have wood which ripens comparatively early, and fruit which though fit to eat early in the winter will last all winter with good care.

Owing to the interest aroused in regard to seedless apples, the present information relative to seedless apples in Canada, and the Spencer seedless in particular, is given.

The results of fruit variety tests in eastern Quebec are brought up to date in a paper by J. C. Chapais. Based on variety tests of vegetables at the Central farm for the past 18 years a list is given of the varieties of each kind considered best to plant. Tabulated data showing the results of variety and pruning experiments with tomatoes are given. Strains of tomato seed saved at the station during the past 3 seasons from the earliest tomatoes ripened have proved earlier every season than plants from seed obtained elsewhere. A tabulated list with notes is given showing the growth of trees in the forest belts at the Central station, together with a descriptive list of the best 30 hardy ornamental flowering shrubs.

R. Robertson reports from the farm for the Maritime provinces brief notes and data on tests of fruits and vegetables, together with a list of vegetables recommended for culture. Similar notes and data are given for the stations at Manitoba and Saskatchewan by N. Wolverton and A. Mackay, respectively. In addition to data on variety tests at the British Columbia station, T. A. Sharpe in charge, descriptions are given of a large number of varieties of apples, pears, plums, and cherries which fruited for the first time in 1906.

Report upon the botanical and agricultural department for the year 1906, A. E. Evans (*Govt. Gold Coast, Rpt. Bot. and Agr. Dept., 1906, pp. 1-18, 27-32*).—A progress report of the botanical gardens of Aburi and branch agricultural stations in the Gold Coast, including data relative to seed and plant distribution and cultural tests of a large number of economic plants, the more important of which are rubber, cacao, camphor, cinnamon, allspice, guinea grain, lemon oil grass, logwood, and several kinds of fiber plants.

In an appendix are given meteorological data for the year and for the past 10 years, together with tables showing the value and quantity of the principal vegetable products exported from the colony during the last 10 years.

Report of the chief, horticultural division, G. S. Scott (*Orange River Colony Dept. Agr., Ann. Rpt., 3 (1906-7), pp. 215-248, pls. 2*).—This report consists principally of lists of varieties of fruits and nuts growing in the different experimental orchards in the Orange River Colony, with remarks on their present condition, together with tabulated data on the test of an American fruit evaporator showing the capacity of the machine and the results for each kind of fruit dried.

New creations in plant life, W. S. Harwood (*New York, 1907, pp. XVIII+430, pls. 50*).—A revised and enlarged edition of this work (E. S. R., 17, p. 771), treating of the life and achievements of Luther Burbank in the development of new varieties of fruits, nuts, vegetables, forage plants, and trees, together with details of the methods employed and the theories advanced by this plant breeder in the production of new varieties.

Plant culture by electricity, H. J. Shepstone (*Sci. Amer., 97 (1907), No. 16, p. 279, figs. 3*).—A brief description is given of the apparatus being used in a test of Thwaite's electric culture system at the Royal Botanic Gardens, London. Some 200 plants, consisting of geraniums, fuchsias, various kinds of palms, grasses, tomato plants, etc., are said to be included in the test.

Studies with asparagus, J. Vercier (*Jour. Soc. Nat. Hort. France, 4. ser., 8 (1907), June, pp. 369-388*).—An account of fertilizer experiments with asparagus conducted by the author in conjunction with several growers in the department of Côte-d'Or, France. Among the questions studied were a comparison of commercial fertilizers with stable manure, the influence of the various chemicals on yield and quality, and the influence of the soil and of chlorophyll on the quality. The results are tabulated and discussed and formulas based on the experiments are suggested for different types of soil.

Relative to the influence of chlorophyll on the flavor, several shoots of blanched, violaceous, and green asparagus were submitted to a jury for a test. The green asparagus appeared to have the best flavor, which is believed to be due to the presence of the chlorophyll.

Cantaloupe breeding, P. K. Blinn (*Colorado Sta. Bul. 126, pp. 10, figs. 5*).—Cantaloupe breeding investigations were commenced at the station in 1903, with a view to developing a rust-resisting cantaloupe. This bulletin contains an outline of the methods employed, together with the results secured, and is presented as an aid to future efforts in cantaloupe breeding. The work through the season of 1905 has been previously noted (E. S. R., 17, p. 765).

Systematic seed selection has been practiced and the melons grown on the same infected plat for 5 consecutive years. With the exception of a few individual plants the plat was practically free from disease during the past season. Reports from commercial growers in the vicinity of Rocky Ford as well as from the Illinois and Indiana stations, where the rust-resistant seed was tested, indicate the possibility of controlling to a considerable extent the injuries from rust fungus by systematic seed selection and breeding.

The work at the station indicates the advisability of making individual as well as plant selections. Although a general uniformity prevailed in the plats from seed having a common parentage a year or two previous, irregularities were constantly appearing among the products of some of the selections, while the tendency to breed true seemed equally characteristic of others. In one case the color of the flesh and the solidly filled seed cavity were uniformly reproduced for 4 succeeding years. The general results secured appeared to have followed Mendel's law. The conclusion is reached that systematic seed breeding will intensify any desired qualities found in cantaloupes as well as in other crops.

Attempts are to be made at the station to combine the rust-resistant character with earlier maturity by means of hybridization. Methods necessary for the artificial cross-fertilization of cantaloupe flowers are briefly discussed, and a summary is given combining the essential points for breeding cantaloupes.

The tree doctor, J. Davey (*New York and Chicago [1907], pp. 235, pl. 1, figs. 217*).—A popular work embracing a variety of subjects relating to the culture of trees, shrubs, vines, and flowers, with a large number of illustrations. Special features of the work include a description of tree surgery, a discussion of pear blight and other blights, the cause of peach yellows and their treatment, grape culture made simple, the destruction of native forests and remedies suggested, and the relation between trees, birds, and insects. The work concludes with a calendar for the treatment of plant diseases and insect pests, prepared by W. J. Green and A. D. Selby.

The water evaporation of fruit trees at the blooming period, A. Osterwalder (*Landw. Jahrb. Schweiz, 21 (1907), No. 7, pp. 287–297*).—An account is given of the author's investigation at the Wädenswil experiment station with regard to the effect of water evaporation during the blooming period on the fertilization and setting of fruit. An examination was made of a large number of apple and pear trees both under laboratory and outdoor conditions, the results of which are given and explained in detail.

The principal inference drawn from this study is that the evaporation of water from the flower petals is insignificant as compared with the evaporation from the leaves, and that the drying out and withering of the flowers in periods of excessive drought and heat more probably results from the excessive transpiration of the leaves than from the great number of blossoms or their delicate structure.

The fruit industry in England, B. Skalweit (*Ber. Land u. Forstw. Auslande, 1907, No. 15, pp. 23, map 1*).—This is a general report on the fruit industry in England, including data with regard to areas and varieties under cultivation, notes on fruit culture in the various counties in Great Britain and a discussion of the influences affecting it, and a description of methods of harvesting, packing, and marketing.

According to data collected from official sources the annual increase in orchard planting during the past 10 years is about 2,500 acres and for small fruits about 1,000 acres. The total acreage of all fruits for 1906 is estimated at about 300,000 acres, which is said to represent about 0.5 per cent of the total area and not quite 1 per cent of the cultivated area of Great Britain.

Fruit varieties most popular on the Pacific slope, E. J. WICKSON (*Bien. Rpt. Comr. Hort. Cal., 2 (1905–6), pp. 388–391*).—The author sent out an inquiry to a large number of correspondents with the view of ascertaining the varieties of different fruits considered best by each. A large number of nurserymen were also requested to name the varieties which were considered best to propagate for sale.

In an extensive list here given the varieties of apples, apricots, cherries, grapes, pears, peaches, plums, and prunes preferred by growers in California, Oregon, Washington, Utah, and Idaho are compared with those varieties preferred for propagation and sale by California nurseries. The varieties are arranged in order of their preference.

The renovation of worn-out orchards, U. P. HEDRICK (*New York State Sta. Circ. 6, n. ser., pp. 4; reprinted in New York State Sta. Rpt. 1906, pp. 449–452*).—In this circular the various causes of deterioration in orchards are briefly discussed. Popular directions are given for orchard renewal work, these including a reduction of the number of trees, thorough pruning, draining and fertilizing the soil, removal of old and diseased portions of the tree, spraying, proper cultivation, and the use of cover crops.

Utilization of the surplus banana crop, F. H. D'HERELLE (*Bol. Ofic. Sec. Agr. Cuba, 3 (1907), No. 3, pp. 241–243*).—The possibilities of using a surplus banana crop for the preparation of dried bananas, preserved bananas, and banana flour are discussed. In the author's opinion they can be most profitably used for the production of fermented spirits.

Peach culture, F. A. WAUGH (*Agr. of Mass. 1906, pp. 446–456*).—Popular directions are given for the cultivation of peaches in Massachusetts. The various phases treated include soils and exposures, planting and planting distances, cultivation, fertilizers, pruning, diseases and other difficulties. and the methods of handling the crop.

Lists of varieties recommended for different purposes are given and the most popular old sorts, as well as the most promising new ones, are described.

Cranberry culture, L. J. FOSDICK (*Agr. of Mass. 1906, pp. 437–445*).—Popular instructions are given for the various phases of cranberry culture, including the selection of the site, turfing, drainage, the water supply, sanding, planting, varieties, cultivation, irrigation, construction of dikes and reservoirs, and the storehouse, fall and winter treatment of the bog, harvesting, packing, and shipping.

Chemical experiments with grapevines, E. ZACHAREWICZ (*Rev. Vit., 28 (1907), No. 722, pp. 429–435*).—In continuation of previous work (E. S. R., 12, p. 852), experiments were conducted on different soils in the department of Vaucluse, in which nonnitrogenous fertilizers were compared with nitrogenous fertilizers and with no fertilizers. The results of these experiments, which cover for the most part the period from 1899 to 1905, inclusive, are tabulated. Practically the same conclusions were reached as in the work previously noted.

Nitrate of soda in connection with sulphate of potash and superphosphate of lime gave advantageous results during the 8 years in increasing the yield, hastening maturity, and giving a higher sugar content. The action of the nitrogen in the nitrate of soda on the vegetative growth and the formation of fruit did not appear to be hindered by drought, as was the case with the nitrogen from organic sources.

In order to obtain the best results the author recommends that the sulphate of potash and superphosphate of lime be broadcasted and turned under as soon as possible after the winter rains. The nitrate of soda should not be applied and worked into the soil until March or April.

Cocos nucifera. Practical treatise on cocoanut culture, E. BOLTEN (*Indische Mercuur, 30 (1907), Nos. 39, pp. 662, 663; 40, pp. 675, 676; 41, pp. 695–697; 43, pp. 736, 737; 44, pp. 748, 749; 45, pp. 766, 767; 47, pp. 804–806, figs. 3*).—In this treatise the author discusses the various phases of cocoanut culture, including climate, soil, varieties, method of propagation, seed bed practices, shading, watering, soil preparation, transplanting and subsequent management, insect pests and diseases and their control, combination cropping, flowering and fruit bearing, together with detailed estimates on the cost of planting, management, and profits.

Report of the inspector of cocoanut plantations for the year 1906, L. C. BROWN (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 9, pp. 295–303*).—The area devoted to cocoanut trees at the end of 1906 is estimated at about 105,000 acres, or an increase of 5 per cent over the previous year (E. S. R., 18, p. 550).

Brief notes are given on the condition of the plantations in the various Malay States, including areas, planting and cultural operations, harmful insects and diseases, the production of cocoanut oil, etc.

At last a hybrid chinquapin (*Rural New Yorker, 66 (1907), No. 3015, p. 824, figs. 2*).—A description, with illustrations, of a hybrid between our native chinquapin and what is described as a fair quality of an unnamed Japan chestnut. The cross was made on the Rural grounds in 1905 and it is believed to be the first intentional hybrid of this nature. Eighteen months after germination the seedling ripened 3 burs containing 3 nuts each, and 4 burs containing a single round nut similar to the chinquapin. The fruit of the seedling is said to be better than the best Japan chestnut under observation, although not so sweet as the wild chinquapin. Several other similar crosses were made which have not yet fruited.

Ether and the forcing of bulbs, J. TAUBENHAUS (*Cornell Countryman, 5 (1907), No. 2, pp. 55–57, figs. 2*).—In continuation of previous work with the white Roman hyacinth (E. S. R., 18, p. 938), results secured with the Spanish iris and with one variety each of fresia and narcissus are given. The bulbs were etherized and planted after different periods of rest, group 1 immediately and groups 2, 3, and 4 after 2, 4, and 6 weeks, respectively. Similar groups were grown in 3 different houses in which temperatures of 54, 70, and 74° F., respectively, were maintained.

From the general results secured it is concluded that ether seems to improve the quality of the flower and its spike as well as to hasten the flowering period from 2 to 8 days. The house maintained at medium temperature is considered most desirable, as it was less expensive and produced practically as good bulbs as the hothouse. Ether does not appear to take the place of the resting stage of the bulbs, etherized bulbs appearing to need a rest of from 2 to 6 or more weeks, this depending on the kind of bulb, as no 2 kinds showed the same result.

All the cattleyas worth growing, L. BARRON (*Gard. Mag. [N. Y.], 6 (1907), No. 6, pp. 281–284, 308, figs. 12*).—Horticultural descriptions are given of the favorite florists' varieties of *Cattleya labiata* grown for the cut flowers, with illustrations of several varieties, a flowering chart showing the blooming period of each and a key to the various forms.

Our country home, FRANCES K. HUTCHINSON (*Chicago, 1907, pp. XVI+278, pls. 56, figs. 59*).—In a popular manner the author gives an account of the transformation of a Wisconsin woodland into a country estate. Chapters are devoted to the construction of the home proper, and to the terraces, kitchen and formal garden, the pergola, shrubs, vines and wild flowers, squirrels and birds, and weeds for decoration. The text is fully illustrated from photographs by the author.

FORESTRY.

Report of the Secretary of Agriculture on the Southern Appalachian and White Mountain watersheds (*Washington: Govt., 1908, pp. 39, maps 2*).—In compliance with a provision of the agricultural appropriation bill for the fiscal year ending June 30, 1908, investigation was made of the watersheds of the Southern Appalachian and White Mountains for the purpose of reporting to Congress the area and conditions of these watersheds, the advisability of their purchase for National forests, and the probable cost. This report embraces the salient features of the investigation, which was conducted from various points of view, including the importance of these forests in their relation to agriculture, water supply, navigation, and the preservation of hard-wood supply. The present condition of these regions is considered as well as the causes which have brought about this condition, including damage through lumbering, clearing, fire, and soil erosion.

The general conclusions arrived at from various phases of the investigation are that the Southern Appalachians and White Mountains are of vast commercial importance to the industries of the country, and that both are encountering well advanced destructive influences which, unchecked, will bring ruin to the regions themselves as well as to many of the industries of the country.

Maps are given of both regions, the area and location of lands needing protection are considered, and it is strongly recommended that the National Government purchase and convert into National forests a definite portion of these lands in order that they may be protected and improved. The treatment of the regions is discussed, together with the methods of acquirement and estimated cost of lands.

The forests of Arkansas, S. J. RECORD (*Forestry Quart., 5 (1907), No. 3, pp. 296–301*).—The forests of Arkansas are briefly discussed with regard to their area, forest regions and types, specific constitution and range, valuation and uses.

The total amount of standing timber in the State is said to be approximately 100,000,000,000 ft., of which pine comprises one-fifth. The total cut for the year 1906 was about 2,000,000,000 ft.

What forestry has done, T. CLEVELAND, Jr. (*U. S. Dept. Agr., Forest Serv. Circ. 140, pp. 31*).—This circular contains statistical data and discussion showing what the development of systematic forestry has accomplished in foreign countries. A table is given showing the expenditures and revenues of the various Government forests considered, from which it appears that higher productiveness is obtained where larger expenditures are made. The author points out that the United States is enormously behind other countries in its expenditures for the management of National forests, and that timely action is needed since forest waste can be repaired only at a great cost. A table taken from Schlich's Manual of Forestry is also given showing the net wood imports and exports of forest countries, from which it is shown that Russia, Sweden, Austria-Hungary, and Canada are making up the wood deficit of a large part of the world. The United States consumes each year from three to four times the wood which its forests produce.

German forest revenue, W. C. TEICHMAN (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 2984, pp. 7–9*).—According to official statistics here given, as compiled by the government of Saxony for the year 1906, a net revenue of $2,126,037 was obtained from the cultivation of 443,105 acres of government forest land, of which 424,246 acres is said to be land covered with trees or soil designated for forest rotation. The total quantity of timber and brushwood cut and sold in 1906 is estimated at 1,421,887 cu. yards, for which $3,374,385 was received.

Nearly 50,000 sq. miles of German soil are adapted to forestry, the value of the wood cut each year being estimated at $60,000,000.

Reports on forest administration in Burma for the year 1905-6, F. B. BRYANT ET AL. (*Rpts. Forest Admin. Burma 1905-6, pp. 169*).—This is a report for the year 1905-6 on the constitution and management of State forests in the Pegu, Tenasserim, northern, and southern circles of Burma, together with financial statements and notes on administration. All the important features of the work are presented in tabular form. The area of reserved forests at the close of the year was 20,544 sq. miles.

Experiments undertaken in the cultivation of mahogany (*Swietenia mahogani*), which have been under way since 1878, are pronounced a failure as the trees do not seem to do well in Burma. The rubber experiments in the Mergui plantation have been successful, and an established concern of some magnitude has been developed. The total expense to date in the work with rubber is given as 229,871 rupees (about $73,558.72), 1,957 acres having been planted. Rubber tapping experiments at the Mergui experimental garden show that trees of from 4 to 5 ft. in girth yield an average of 18.08 oz., and trees of over 5 ft. in girth an average of 30.98 oz. of rubber per tree. The average price realized for rubber was $1.30 per pound.

Suggestions to woodlot owners in the Ohio valley region, S. J. RECORD (*U. S. Dept. Agr., Forest Serv. Circ. 138, pp. 15*).—This circular is issued with the view of supplying information to farmers and others in the Ohio valley region concerning the proper management of their timber lands. The conclusions, based on examinations by the Forest Service of a large number of woodlots and forest tracts in that region, are embodied in the subject-matter, which treats of the present condition, status, and uses of the woodlot, the protection of the woods from grazing, fire, and wind, and in felling operations, the value of different species, and the model woodlot. Suggestions are given for the improvement of woodlots of different types, including the dense first-growth forest, mature open stand, dense young stand, and sapling thicket.

In addition to the Ohio valley region, most of the information contained herein is applicable to southeastern Iowa, northern Missouri, and the southern portions of Michigan and Wisconsin.

Forest planting in Vermont, L. R. JONES and C. R. PETTIS (*Vermont Sta. Bul. 132, pp. 24, figs. 5*).—This bulletin contains information relative to the present outlook as to forest planting, the best kinds of trees to plant, the seedlings, etc., to be offered for sale through the State nursery in the spring of 1908, and suggestions relative to securing stock from commercial nurserymen, planting operations, and starting trees from seed. A brief summary is also given of the Vermont laws and regulations of interest to tree planters.

"Average log" cruise, W. J. WARD (*Forestry Quart., 5 (1907), No. 3, pp. 268-277*).—An account is given of this method of estimating the volume of standing timber as evolved by the writer during 2 years' experience in examining and purchasing timber lands on the Pacific coast. The underlying principles and theories governing the work are discussed, together with their application in the field and office.

North American gymnosperms, D. P. PENHALLOW (*Boston, 1907, pp. VIII+374, figs. 103*).—This work treats of the anatomy and classification of the gymnosperms of North America. In its preparation a study was made of 92 species from North America, 29 species from Japan, and 4 species from Australasia. The system of classification as here presented is based upon a study of the anatomical structure of the stem, exclusive of the structure of the pith and the bark, and has been prepared with the view of meeting the needs of the scientific botanist in prosecuting researches either in recent or fossil forms, as well as for its adaptation to the requirements of the practical engineer and forester.

Part 1 deals primarily with the anatomy of the stem. General directions are given in the first chapter for the preparation of material and the value of particular sections. Subsequent chapters deal with the growth ring, tracheids, bordered pits, medullary rays, wood parenchyma, resin passages, and general phylogeny. Chapters are also devoted to the durability of woods and their preservation as fossils, and the mode of action and effects of decay. Part 2 is a synopsis of genera for the cordaitales, gingkoales, and coniferales, based on the details worked out in part 1. In appendices A and B are given tables of anatomical data and volume tables of tracheids and thickness of walls in various trees.

The text is accompanied with an extensive bibliography and numerous figures illustrating transverse, radial, and tangential sections studied.

The principal timbers of New South Wales and their uses, R. D. HAY (*Sydney, 1906, 2. ed., pp. 25, pls. 14*).—This pamphlet is compiled from various reports on the timbers of New South Wales and is intended to give information in regard to these timbers and their uses.

The principal timbers are classified and described and extracts are given from reports on their adaptability for wood paving, wharfage and harbor work and railway construction, together with a summary of the results and conclusions on the strength and elasticity of New South Wales timbers as derived from experiments made by W. H. Warren.

The red mahogany (Eucalyptus resinifera), F. ALBERT (*La Caoba Roja o Eucalyptus Resinifera. Santiago de Chile: Govt., 1907, pp. 34, figs. 11*).—A monograph on this species of the eucalypt, including its origin, common names and synonyms, botanical description, the timber and its uses, climatic and soil requirements, cultural range, methods of propagation and planting, sylvicultural management, and exploitation.

Forest soil, A. GRÉGOIRE (*Bul. Soc. Cent. Forest. Belg., 14 (1907), No. 7, pp. 380–397, figs. 2; abs. in Ann. Gembloux, 17 (1907), No. 10, pp. 576–578*).—This is a brief critical review from the standpoint of the forester of present agrological knowledge.

Consumption of poles in 1906 (*U. S. Dept. Agr., Forest Serv. Circ. 137, pp. 9*).—Statistical data collected and compiled by the Bureau of the Census in conjunction with the Forest Service are given, showing the consumption of poles during 1906 as based upon the number of poles purchased during the year. Returns from over 6,000 telegraph and telephone companies, electric light, power, and trolley systems, etc., give a total of 3,574,666 poles, valued at $9,471,171 at the point of purchase. Poles shorter than 20 ft. were not included in the estimate.

The tabulated data show the length, number, and value of round and sawed poles purchased in 1906, together with the number purchased by various classes of consumers. Cedar and chestnut are the two principal species used. Owing to the increased cost of poles and the difficulty of securing a sufficient quantity of satisfactory stock the preservative treatment is being more generally used.

Tests of vehicle and implement woods, H. B. HOLROYD and H. S. BETTS (*U. S. Dept. Agr., Forest Serv. Circ. 142, pp. 29, figs. 15*).—The results are given of tests conducted at Lafayette, Indiana, in cooperation with Purdue University, to obtain a better knowledge of the mechanical properties of the woods used in the manufacture of vehicles and implements and of the woods which might be substituted for those at present used. The various kinds of wood used are considered relative to their use for light vehicles, heavy vehicles, and for implements. Tabulated data with numerous figures relative to laboratory tests made with buggy spokes and shafts, wagon axles, and wagon and cultivator poles of different species of wood are given and discussed.

While the tests in some cases are considered only suggestive, owing to the small number of samples tested, some general conclusions are drawn relative to the present methods of grading, together with suggestions for their improvement.

Turpentine and rosin (*Bur. of the Census* [*U. S.*] *Bul. 85, pp. 43–51*).—A comparative statistical discussion of the manufacture of turpentine and rosin, as reported from the census of 1905 and at previous censuses, together with a discussion relative to the immediate future of the industry.

Wood paving in the United States, C. L. Hill (*U. S. Dept. Agr., Forest Serv. Circ. 141, pp. 24, figs. 3*).—With the view of securing some cheaper and more abundant varieties of wood than longleaf pine for use as paving blocks, the Forest Service gathered data upon creosoted block pavements in several cities in the United States where such pavements are used, and at those creosoting plants which treat wood paving blocks.

In the present circular the data thus secured and the conclusions drawn from them, together with a description of an experimental pavement laid in the city of Minneapolis, are given. The various phases discussed include the progress of wood paving, the qualities of creosoted wood pavement as compared with other forms of pavement, the cost, service, durability, traction resistance and freedom from slipperiness of wood pavements, problems in wood paving relative to knowledge of the wood, use of laboratory tests, creosoting, and a discussion of the points involved in laying pavements.

The woods used in the experimental pavement at Minneapolis were longleaf pine, Norway pine, tamarack, Douglas fir, western larch, white birch, and hemlock. Traffic records are to be taken by the city authorities at regular intervals. The final results will not be obtained for several years. With reference to the use of Norway pine for paving blocks, it is stated that after 5 years' service there is no discernible difference in wear between the heart and sap portions of unseparated blocks. Norway pine appears to be wearing as well as longleaf pine.

The influence of fresh and salt waters on the utilitarian properties of the principal species of wood, G. Janka and N. L. R. von Liburnau (*Mitt. Forstl. Versuchsw. Österr., 1907, No. 33, pp. VIII+115, figs. 16*).—The investigations included a cooperative study of the influence of fresh and salt water on both the mechanical and technical properties of wood, and upon their chemical analyses. The tests included observations on shrinking, swelling, and checking, and as to the effect upon durability and strength. The results are set forth in numerous tables and further discussed.

The general conclusions are reached that the soaking of wood in fresh water, such as occurs in the process of rafting the logs and where wood becomes frequently wet from showers, and in similar ways, exerts a favorable influence on the wood by decreasing the hygroscopicity and thereby decreasing the shrinking and swelling, as well as lessening the danger of cracking to some extent. A favorable influence is also exerted on the durability of the wood, although the strength is lessened to a slight degree. Soaking in salt water appears to lessen the shrinking over that of unsoaked wood, but with the increased higher salt content the hygroscopicity is increased, which causes a greater degree of swelling and warping when the wood is exposed to a variable temperature. It cracks less than unsoaked wood but its compression strength is also less than that of wood in the air-dry condition.

The use of wood soaked in fresh water is strongly recommended for artistic and industrial purposes, whereas wood soaked in salt water is only recommended for use where warping in a changeable moist atmosphere is of less consequence than the durability of the wood. Salt water soaked wood should be completely air-dried before being used and should not be used in fine woodwork, as the salt in the presence of moisture is apt to cause rust streaks upon coming in contact with iron.

The seasoning and preservative treatment of arbor-vitæ poles, C. S. SMITH (*U. S. Dept. Agr., Forest Serv. Circ. 136, pp. 29, figs. 7*).—An account is given of experimental work conducted by the Forest Service in cooperation with the American Telephone and Telegraph Company, with the view of investigating the various methods of seasoning and preserving arbor-vitæ poles to increase their length of service.

The seasoning test included 446 poles. These were peeled immediately after being cut and skidded in the woods in single tiers about 2 ft. above the ground. Each pole was numbered and weighed and its circumference at 6 and 30 ft. from the butt recorded. These measurements were again taken after a long period of seasoning, and a series of circumference measurements was also made at the butt and at successive 5-foot points to determine the volume, weight per cubic foot, and taper of an average pole. Note was also made of checking during seasoning.

The data secured are presented in several tables and diagrams and show the meteorological conditions in northern Michigan during the entire period of seasoning, the average volume of poles, the relation of moisture content to seasoning time, the weight and moisture content both by monthly and by seasonal cuts, the percentage of freight weight saved by seasoning, the relative economy of various cutting seasons and shipping times, the effect of rate growth upon seasoning, shrinkage, checking, and action of fungi and insects, and the form, age, and condition of arbor-vitæ poles.

At the conclusion of the seasoning experiment several methods of treating the pole butts were tried, including brush treatments with carbolineum and creosote and open-tank treatments with creosote. Records were kept of duration of treatment, temperature of oil, and depth of penetration. In addition to the 446 seasoned poles 43 green ones were treated, together with 3 tamarack poles. The data secured from this work are given and discussed and several conclusions are reached relative to the methods of seasoning and treating. The poles included in the experiment are to be set in an experimental line and further tested.

The creosoting of home-grown timber, W. B. HAVELOCK (*Quart. Jour. Forestry, 1 (1907), No. 4, pp. 350–353*).—Tabular results are given of a recent experiment conducted by the author (see also E. S. R., 18, p. 148), in which tests were made to ascertain the absorption of creosote oil by 27 kinds of round timber. The timber was felled in December, 1906, cut into 8 ft. lengths and allowed to season outside protected from the rain until May 29. Previous to the creosoting a vacuum of 9 lbs. was maintained in the cylinder for some time, after which the oil was injected and kept under a pressure of 85 lbs. per sq. in. for 3 hours. The tabulated data show the species of timber treated, the number of pieces, weight previous and subsequent to barking and before and after creosoting, total increase in weight, and weight of creosote oil absorbed per cubic foot, with notes on the penetration in each case.

A primer of wood preservation, W. F. SHERFESEE (*U. S. Dept. Agr., Forest Serv. Circ. 139, pp. 15*).—This circular treats of the importance and use of preservative materials in prolonging the life of timbers. A discussion is presented of wood preservation, the nature of decay, and the methods of retarding it by seasoning and by chemical impregnation, with an account of the various preservatives and processes in use in the United States. The economic value of wood preservation and its influence on forestry in the future is also discussed.

Notes on rubber cultivation, J. A. Wyllie and O. G. Ferreira (*Madras, 1907, pp. XIV+131, pls. 16*).—These notes deal with the culture and exploitation of the important rubber-producing species in various tropical countries, with special reference to the development of the industry in Portuguese India, and include the botanical description, soil and climatic conditions, habits, methods of reproduction, planting, harvesting, and preparation of the rubber. Numerous estimates are given with regard to returns secured from capital invested, and the work concludes with a chapter devoted to a discussion of the lessons to be learned from the Ceylon rubber exhibition of 1906.

DISEASES OF PLANTS.

Some diseases of Rocky Mountain plants, L. H. Pammel (*Proc. Iowa Acad. Sci., 13 (1906), pp. 89–114, pls. 6*).—The author describes the geographical distribution and host plants, general and microscopical characters, and economic aspects of a number of fungus and other parasites observed on some Rocky Mountain plants. Among the fungi noted are *Peridermium cerebrum*, *P. elatinum*, *P. abietinum*, *Exoascus nanus*, *E. cerasi*, *Taphrina cærulescens*, *Podosphæra oxyacanthæ*, *Phyllactinia suffulta*, *Uncinula salicis*, *Plowrightia morbosa*, etc. The phænogamic parasites described are ***Arceuthobium robustum***, *A. americanum*, and *A. douglasii*, which occur on various coniferous trees.

A northwest tuckahoe, J. Fletcher (*Canada Expt. Farms Rpts. 1906, pp. 232–234, pl. 1*).—A description is given of a sclerotium form of some fungus, probably a Polyporus, which is more or less frequently met with in parts of Canada. They are usually found during the process of plowing land and excite considerable interest. Specimens have been found surrounding pieces of wood, and it appears probable that the fungus is at first parasitic on certain species of poplars and perhaps also on willows.

Investigations on some imperfect fungi and their associated ascomycetous forms, H. Klebahn (*Ztschr. Pflanzenkrank., 17 (1907), No. 4, pp. 223–237, pl. 1, figs. 2*).—The ascospore form of *Marssonia juglandis* and the various reputedly associated fungi have been subjects of investigation by means of cultures and inoculation experiments. The author is convinced of the relation between *M. juglandis* and *Gnomonia leptostyla*, or *Glœosporium juglandis*, as it is often referred to.

The author states that as no perennial mycelium or other special device for wintering the fungus has been found, it must pass the winter in fallen leaves, and for the prevention of the spread of the disease these should be collected and destroyed.

Fungus diseases and spraying, W. T. Macoun (*Canada Expt. Farms Rpts. 1906, pp. 121–124*).—After giving a brief account of the more troublesome diseases observed during the season, the author describes pear blight, the sooty or fly-speck disease of apples, black rot of tomatoes, and onion blight or mildew.

For pear blight cutting out the infested areas and treating the cut surfaces with some antiseptic is recommended.

The sooty or fly-speck fungus (*Leptothyrium pomi*) is said to have caused more trouble than usual, disfiguring much fruit. The fungus develops in the summer, after the time when the trees are ordinarily sprayed, so that an additional spraying is recommended for its prevention.

The black rot of tomatoes is said to have been quite destructive in the vicinity of Ottawa, and the thorough use of Bordeaux mixture is recommended for its control.

In some districts of Ottawa the onion blight (*Peronospora schleideniana*) proved serious during the season covered by the report. While the disease may be checked by change in weather conditions, it is advised that the fields be sprayed with Bordeaux mixture from the end of June throughout the growing season.

Diseases of pepper and beans, H. R. FULTON (*Louisiana Stas. Bul. 101, pp. 21, pls. 15*).—A disease of pepper, to which the name pepper blight is given, is described. The first indication of this disease is seen in the slight drooping of the young leaves, which may recover at night and appear perfectly normal the next morning; but during the second day the wilting is more pronounced, and finally the whole plant is affected and dies. An examination of the roots of the plant in the early stages of the disease shows discolored, sunken areas just below the level of the ground and sometimes on the larger roots. When the disease has attained a later stage and defoliation of the plant has begun, the areas are larger, more sunken, and more discolored, and in the central portion the bark has begun disintegration. The attacks usually begin when the plants begin to form pods and continue until the end of the growing season. The cause of this disease is a fungus, the spore-bearing form of which is not known.

This disease has been known for a considerable time in Louisiana and was first reported from Florida in 1893 (E. S. R., 5, p. 790), as attacking the tomato and a large number of other plants. In Louisiana it has been observed by the author attacking pepper, bush and pole beans, and the Japanese fiber plant (*Edgeworthia papyrifera*).

The fungus is apparently a soil organism, and it has been demonstrated that the application of a clear fungicide, such as ammoniacal copper carbonate or eau celeste, to the ground about the base of the plants will protect them from attack.

Inoculation experiments with the fungus have proved successful in inoculating not only pepper but also a number of other economic plants.

The bean diseases described are anthracnose, bacterial blight or bacteriosis, a blight or wilt caused by a sclerotium-producing fungus, and a pod and stem rot caused by Rhizoctonia.

The anthracnose, due to *Colletotrichum lindemuthianum*, and the bacterial blight, caused by *Pseudomonas phaseoli*, may be controlled by practicing seed selection, the removal of affected plants, rotation of crops, and spraying.

The fungus blight of beans, due to the sclerotium-producing fungus, which also attacks pepper plants, causes the wilting of the leaves, followed by the death of the plants. The means suggested for the control of the blight on pepper should be adopted for the protection of beans against this fungus.

The pod and stem rot, due to Rhizoctonia, manifests itself in three ways—the damping off of the seedlings, a dry rot of the stems, and the occurrence of brown sunken areas on the pods. During 1907 the last two forms of disease were abundant in Louisiana and were given some attention. So far as the author's observations go, the rot of the pods due to Rhizoctonia becomes serious only when the conditions of warmth and moisture are rather extreme. The fungus is a soil organism and should be combated by care in the selection of seed, the destruction of old stalks and leaves, and rotation of crops.

On the occurrence of Phytophthora infestans and Plasmopara cubensis in Ohio, A D. SELBY (*Ohio Nat., 7 (1907), No. 4, pp. 79–85*).—The author calls attention to the fact that the fungus causing the late blight and rot of potatoes is of comparatively rare occurrence in Ohio, and he points out the relationship between the occurrence of this disease and the climatic conditions during the growing season. It appears that *Phytophthora infestans* is prevalent in Ohio only during seasons of abnormally low temperature accompanied with an abundance of moisture. When the temperature is high the fungus does not seem to be able to develop, but there appears to be cyclic periods of low summer temperature when an outbreak of late blight of potatoes may be expected.

In relation to the downy mildew of the cucumber, the conditions are just the reverse, as it requires a high temperature for the development of the fungus, and the outbreaks of the disease on cucumbers and allied plants in Ohio have coincided with seasons that were warmer than the average. A cool season results in a late development of the fungus, and apparently the optimum temperatures for the development of *Plasmopara cubensis* are probably near the summer maximum in Ohio. The author believes that this fungus, for which no öospores are known, is in all probability propagated by the conidia spreading on wild and other cucurbits, and that the advance is limited by the summer temperatures.

Plans for procuring disease resistant crops, H. L. BOLLEY (*Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 107–114*).—A description is given of the author's experiments with wheat, flax, and potatoes to secure strains immune to disease. The method in brief is to provide all known conditions for the disease in order to eliminate the weak plants. It is believed that this procedure will at least bring about conditions for a study of the principles underlying what is known as resistance to plant diseases.

A disease of chicory, H. BLIN (*Rev. Hort. [Paris], 80 (1908), No. 1, pp. 16–18*).—Attention is called to a disease of chicory which is said to be especially destructive in the process of blanching. This disease, which is caused by *Sclerotina libertiana*, is probably present when the plants are placed to blanch. Basing his opinion on the effect of a copper sucrate fungicide on other plants, the author believes that this would be efficient in reducing the loss.

Potato diseases in 1907, W. J. MORSE (*Maine Sta. Bul. 149, pp. 287–330, pls. 4, dgm. 1*).—The prevailing conditions in 1907 are said to have been favorable for the development of potato diseases in Maine. A series of investigations was carried on as to different measures for the protection of potatoes, the results of which are given at some length.

A number of dust sprays were compared with ordinary Bordeaux mixture for the prevention of potato blight, with results showing that Bordeaux mixture as usually prepared was decidedly more efficient than any of the dry or commercial preparations tested.

The relative efficiency of light and heavy spraying was determined, plats being double sprayed, that is, sprayed in opposite directions on the same dates, and comparisons made with single sprayings. The yields from 6 heavy sprayings, carried on in 2 different localities, were 45 bu. per acre in one case and 77 bu. per acre in the other more than the best yields of the remaining plats.

In continuation of previous experiments with formaldehyde gas for the prevention of potato scab (E. S. R., 18, p. 1140), the author treated at one time seed potatoes sufficient for the planting of 20 acres. These were arranged in slat bins in a tight inclosure and subjected to gas given off by the application of 4 pints and 1 oz. of formaldehyde to 31½ oz. of potassium permanganate. Comparisons made with tubers soaked in a solution of formaldehyde confirmed previous conclusions regarding the use of formaldehyde gas for the treatment of large quantities of seed potatoes. Little injury followed the use of formaldehyde gas, but the author calls attention to the necessity of having the receptacle containing the gas at some little distance from the potatoes. Where they were immediately over the vessel in which the formaldehyde and potassium permanganate were placed considerable injury was done to the tubers.

From a study made on the effect of the application of lime on the production of scabby potatoes, it was found that the application of 1,000 lbs. of lime per acre immediately before planting tended to increase the percentage of scabby potatoes. Where lime is to be applied to the soil it should be done at least 3 years before potatoes are used in the rotation.

Notes are given on internal brown spot of potato tubers, in which a peculiar spotting of the interior of the tubers is noticed, although the surface presents a healthy, normal appearance. The variety reported upon was Burpee Extra Early and the tubers were grown on rather dry, sandy loam. So far no organism has been found connected with this disease, and the trouble is not believed to be transmitted but to be due to some disturbance in the physiological processes of the plant.

A surface spotting of tubers by *Phytophthora infestans* was reported early in 1907, in which black spots varying in size were noticed on the surface of potatoes. It was found that these potatoes had been dug rather early in September, when the tubers were not mature and were easily bruised in digging and handling. The spores which had fallen on the bruised tubers germinated, but on account of adverse temperature and moisture conditions the mycelium passed into a resting stage instead of penetrating further into the tissues and producing the usual characteristic dry rot of the tuber.

Notes are given on a disease of potatoes, to which the name blackleg is given. This disease is common in parts of Europe, but has only recently been recognized in this country (E. S. R., 19, p. 248).

In concluding the bulletin the author gives an account of experiments with red lead as an insecticide. It has been claimed that this substance possesses marked insecticidal qualities, but tests made with it showed that while it was a repellant against the larvæ of the potato beetle, there was nothing to recommend it as a substitute for Paris green as an insecticide.

The brusone disease of rice, R. FARNETI (*Atti Cong. Risicolo Internaz., 3 (1906), pp. 79–101*).—A detailed report is made of investigations on the disease of rice known as brusone or blast, in which the author describes the characteristics of the disease, methods of transmission, influence of temperature and climate on its development, and the various methods which have been suggested for its prevention. The author believes that *Piricularia grisea*, *P. oryzæ*, and *Helminthosporium turcicum*, all of which have been described as causing this disease, are different stages in the life history of a single species of fungus.

The root disease of sugar cane, H. R. FULTON (*Louisiana Stas. Bul. 100, pp. 21, pls. 7*).—A description is given of a root disease of sugar cane caused by the fungus *Marasmius plicatus* a previous account of which has been noted (E. S. R., 19, p. 751). Affected plants have a deficient root development, and the lower sheaths are cemented together about the canes. The fungus grows saprophytically on decaying vegetation and seems to show a strict selective preference for cane plants. Spores are abundantly formed, but as the fruit caps are produced only under favorable conditions, there is probably little increase of the fungus through the production of spores. It is believed to spread largely through the mycelium, and causes at times considerable loss. It affects the plants by destroying the roots and smothering the germinating buds by mechanically matting the leaf sheaths over them.

As preventive measures the author recommends careful cultivation, selection and disinfection of seed cane, the planting of resistant varieties, destruction of infected trash, and resting the cane lands.

Inoculation experiments were carried on which seem to indicate that the fungus is readily transferred to cane, and all indications point to the conclusion that this species gains entrance only after the outside cells of the attacked portion of the cane plant have been killed. The killing is believed to be accomplished through some physiological activity of the parasite.

Some parasites of citrus, rubber, tea, royal palm trees, etc., C. Bernard (*Bul. Dépt. Agr. Indes Néerland, 1907, No. 11, pp. 55, pls. 3*).—Descriptions are given of a number of fungi which are associated with the sooty mold of citrus, Castilloa rubber, coffee, and guava trees, *Capnodium stellatum* and *C. guajavæ* being described as new species. Among the parasites of tea, *Stilbella theæ* and *Helminthosporium theæ* are characterized as new species. An account is given of *Pestalozzia palmarum* on the royal palm, *Nectria bogoriensis* n. sp. on vanilla, and *Ramnularia undulata* n. sp. on the leaves of citrus trees. The new species are technically described.

In addition to the fungi, the author notes the occurrence of a species of Tetranychus on tea and Phytoptus on species of papayas, tomatoes, etc.

Suggestions are given for the control of these parasites, so far as definite means are known.

The Hemileia disease of coffee, J. Buis (*L'Hemileia et l'Avenir du Caféier a Madagascar et a la Réunion. Paris, 1907, pp. 1-24, figs. 2*).—A description is given of the disease of coffee trees due to the fungus *Hemileia vastatrix*, with suggestions for its control. The means suggested include the collection and destruction of infested leaves, the use of fungicides, the selection of relatively cool and dry localities for coffee plantations, the use of resistant varieties and races of coffee, and better cultivation of plantations. The Arabian coffee seems most subject to this disease, and Liberian, Kongo, and certain Java and other hybrids are quite resistant.

An important gap exists in our knowledge regarding this fungus, and the author suggests concerted studies on its life history to determine the host plants of its alternate generations. A knowledge of the intermediate hosts, it is believed, would be of advantage in combating the disease.

A disease of coffee, G. Delacroix (*Agr. Prat. Pays Chauds, 8 (1908), No. 58, pp. 66-78, pls. 2*).—The author describes a disease of Liberian coffee due to the alga *Cephaleuros virescens*. It is said to be associated with a fungus forming a lichen probably belonging to the genus Strigula.

Spraying with Bordeaux mixture having given good results in controlling this pest on tea, the author advises the use of this fungicide on coffee when the parasite is abundant.

A disease of birch catkins, F. W. Neger (*Ber. Deut. Bot. Gesell., 25 (1907), No. 7, pp. 368-372, fig. 1*).—The author describes a disease of the female catkins of birch, which causes a portion or all of the catkin to turn brown, the upper half in some instances retaining its original green color. The disease has been rather destructive, and a study of its causes seems to indicate that it is due to a species of Botrytis. Comparisons are drawn between this organism and *Sclerotinia betulæ*, which has been described as occurring on the catkins, and the author also compares it with *S. coryli*, a leaf disease of related plants. In no instance is he convinced of the identity, although it appears to be most nearly related to *Botrytis cinerea*.

Two diseases of poplar trees, E. Raignault (*Jardin, 21 (1907), No. 493, pp. 264, 265*).—For a number of years the Lombardy poplars in the vicinity of Paris have, according to the author, been attacked by fungus diseases, which render their culture difficult and in some places almost impossible. These diseases are caused by the fungi *Napicladium tremulæ* and *Taphrina aurea.*

The disease caused by Napicladium is characterized by attacks early in the spring on young shoots when they are beginning their development. Later through a lack of nourishment they become dry and dead. The fungus is abundant, the conidia appearing on the surface early in June, when the small black spots appear on the leaves, which later dry up.

This disease seems to be particularly destructive, the author stating that in some regions it has made the growing of the Lombardy poplar practically an impossibility. The death of the trees has usually been attributed to meteorological and soil conditions, but in reality is caused by the parasitism of the fungus.

The thorough use of fungicides at the beginning of leaf development has proved efficient in controlling this disease, but it is impracticable to spray the large trees and the author recommends that this treatment should be confined to young trees in the nurseries.

The other disease, due to *T. aurea*, is confined to the leaves, on which the fungus forms bladder-like areas characteristic of this genus of fungi. In addition to the Lombardy poplar, the Taphrina is found on other species, where it deforms the leaves. Where young trees are attacked, the author advises the collecting and burning of the infected leaves and spraying the trees with some copper fungicide.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A preliminary order of birds in Missouri, O. WIDMANN (*Trans. Acad. Sci. St. Louis, 17 (1907), No. 1, pp. 288*).—An annotated list is given of the birds observed to occur in Missouri. In the introduction to this catalogue bibliographical references are given and a discussion of faunal areas, climate, topography, and related matters is presented. The reduction in the number of birds during recent years is in part due to the gradual extension of agriculture and the destruction of the natural habitats of birds. A plea is made for the protection of birds, especially those species which are of economic importance.

The food of birds, N. PASSERINI and G. CECCONI (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 4 (1907), No. 3, pp. 334-424*).—During the investigations reported in this paper the stomach contents of 70 species of birds were examined for the purpose of determining the food habits of these birds. The results are presented in tabular form. The authors note the comparative frequency with which empty stomachs are found in various species of birds.

With regard to the insect food of birds, injurious species of insects were found in bird stomachs only in rare cases. The authors believe that many published statements to the effect that birds are of great value in destroying injurious insects are based on superficial observations without the examination of stomach contents.

Food habits of the grosbeaks, W. L. MCATEE (*U. S. Dept. Agr., Bur. Biol. Survey Bul. 32, pp. 92, pls. 4, figs. 40*).—The author examined the stomach contents and observed the feeding habits of the cardinal, gray, rose-breasted, black-headed, and blue grosbeaks. The grosbeaks belong to the finch family and are general feeders, their food being about half vegetable and half animal. The vegetable food was largely seeds. The five species studied by the author consumed 9 times more weed seed than grain and fruit, and 19 times more injurious than useful insects. The species in question are, therefore, considered as well worthy of protection and of great economic value to the farmer.

In connection with the discussion of each species detailed statements are given concerning the kinds of vegetable and insect food consumed.

The recent progress and present conditions of economic entomology, L. O. HOWARD (*Science, n. ser., 26 (1907), No. 675, pp. 769–791*).—A comprehensive review is given of the present status of economic entomology in this and foreign countries and of the results obtained in the course of investigations which have been carried on in this Department, the agricultural experiment stations, and foreign entomological institutions.

The future of economic entomology, H. T. FERNALD (*Pop. Sci. Mo., 72 (1908), No. 2, pp. 174–178*).—Attention is briefly called to the progress made in applied entomology during the past 50 years. Effective methods for the control of many of the most serious insect pests have been devised, but these methods are followed by only a small percentage of farmers, so that the annual losses from injurious insects are increasing. It is suggested that losses from this source may be checked to some extent by the further utilization of insect parasites and by breeding resistant varieties of plants.

Division of entomology, J. FLETCHER (*Canada Expt. Farms Rpts. 1906, pp. 205–231, pl. 1*).—During the year under report observations were made on a large variety of insects injurious to field crops, garden crops, fruits, and forest trees. Wheat was somewhat injured by the attacks of *Bibio gracilis*. Recommendations were made regarding methods of control of cutworms in grain and various other crops. Remedies are also suggested for use in combating potato beetles, potato leaf aphis, asparagus beetles, codling moth, apple maggot, oyster-shell bark-louse, San José scale, and white grubs. A few specimens of the brown-tail moth have been found in Canada, and an outline is given of the life history, habits, and suitable remedies for this pest in order to assist in checking its spread. Among the forest insects upon which observations were made by the author mention may be made of the spruce gall louse, fall webworm, tussock moth, and white cedar twig-borer.

Notes on insect, fungus, and other pests, R. S. MACDOUGAL (*Jour. Bd. Agr. [London], 14 (1907), No. 8, pp. 477–484, fig. 1*).—Brief economic notes are presented on corn sawfly, *Neuroterus lenticularis*, apple sawfly, and other pests. For the control of apple sawfly, the author recommends handpicking from the apple blossoms and the destruction of all infested apples.

Insect injuries in the spring of 1907, L. REH (*Naturw. Ztschr. Land u. Forstw., 5 (1907), No. 10, pp. 492–497*).—An account is given of injuries due to white grubs, *Cheimatobia brumata*, *Tortrix viridana*, brown-tail moth, and species of Chermes. Brief mention is also made of the work of insectivorous birds.

The entomological section, C. W. HOWARD and F. THOMSEN (*Transvaal Agr. Jour., 5 (1907), No. 20, pp. 947–958, pls. 5*).—During the year under report particular attention was given to the brown locust and red locust, the agricultural department of the Transvaal carrying on demonstration tests in cooperation with farmers in their eradication. The best results were obtained by the application of arsenical sprays to the young locusts before they were able to fly.

The destruction of cockroaches, bedbugs, and other household insects by means of hydrocyanic-acid gas is briefly described. It is recommended that 1 oz. of potassium cyanid and 1 oz. of sulphuric acid be used for each 100 cu. ft. of space. For fumigating poultry houses to destroy ticks the strength of the mixture may be 3 times greater. A brief account is also given of *Bengalia depressa* which attacks man.

The entomological section, C. W. HOWARD and F. THOMSEN (*Transvaal Agr. Jour., 6 (1907), No. 21, pp. 85–102, pls. 5, figs. 3*).—An elaborate series of tests was made to determine suitable materials for treating wood to protect it against the attacks of white ants. It was found that any arsenical solution is efficient. Good results were also obtained from tar, creosote, and carbolic acid.

On the other hand, soaps, tobacco extracts, oils, corrosive sublimate, calcium chlorid, soda, and alum proved to be of no avail.

Biological and economic notes are also given on cockchafers and flower beetles. Directions are furnished for fumigation of nursery stock and greenhouses with hydrocyanic-acid gas.

Biological notes on Megilla maculata, A. A. Girault (*Jour. N. Y. Ent. Soc., 15 (1907), No. 4, pp. 193–197*).—Specimens of this ladybird were kept in captivity for the purpose of taking observations on the period of incubation, the duration of the larval stages and the behavior of the adults under these conditions. Data are given in tabular form on the observations thus made.

Preliminary note on the distribution of the tiger beetles and its relation to plant succession, V. E. Shelford (*Biol. Bul. Mar. Biol. Lab. Woods Holl, 14 (1907), No. 1, pp. 9–14*).—A study of the distribution of the common species of the tiger beetle in the vicinity of Chicago showed that each species is found chiefly in a certain habitat to which it appears to be best adapted. The faunas observed in these different habitats were strikingly different. The author believes that the local flora and plant succession are factors which must be taken into account in the consideration of the distribution of animal species.

An injurious North American species of Apion, with notes on related forms, F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Bul. 64, pt. 4, pp. 29–32, fig. 1*).—*Apion griseum* is reported as injurious to the seeds of *Phaseolus retusus* and *P. wrightii.* The same insect has been observed to develop in the seed of *P. polystachyus*, and is believed to be the species which has been reported as living in *P. pauciflora.*

Brief biological notes are also given on *Apion colon* and a number of other species of this genus.

Migrations of locusts and means of combating these pests, J. S. De Anchorena (*Com. Defensa Agr. [Buenos Aires], Bol. Mens. Mov. Langosta, 1907, Sept., pp. 11, map 1*).—Statistics are given on the extent of destruction of locusts in the adult and egg stages in various provinces of Argentina. During the months of July, August, and September in 1907 adult locusts were destroyed to the extent of more than 8,000,000 kilos.

The destruction of locusts (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 10, pp. 1258–1265*).—A formula is given for the preparation of white arsenic and sodium arsenite solutions of various strengths for use in poisoning locusts. Mention is also made of the egg-laying habits of locusts and of a snake which feeds upon these insects.

Combating the larvæ of grain flies, Tacke (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 5 (1907), No. 11, pp. 121, 122*).—The larvæ of various species of Tipula sometimes cause great damage. They are not confined to any particular kind of soil and may attack almost all sorts of agricultural plants. The usual remedies of applying fertilizers, carbon bisulphid, etc., proved of little avail, and the only remedies which gave satisfactory results were thorough rolling of the soil and the encouragement of insectivorous birds, particularly the starling.

The tobacco suck fly, J. R. Inda (*Com. Par. Agr. [Mexico], Circ. 69, pp. 6, fig. 1*).—The life history and injuries caused by *Dicyphus minimus* are described and brief notes are given on its natural enemies. In combating the pest the author recommends clean cultivation, the destruction of rubbish about tobacco fields, and the application of a nicotine solution to affected plants.

Insects injurious to vegetables, F. H. Chittenden (*New York and London, 1907, pp. XIV+258, figs. 163*).—Garden crops are subject to the attack of a great variety of insect pests, but in the author's opinion these pests have received relatively less attention than those of fruit trees. The purpose of the present volume is to present a succinct account of the appearance, habits, life history, and means of combating the important insect pests of garden crops, among which particular mention is made of asparagus, beans, peas, beets, cabbage, cucurbits, celery, parsnips, sweet corn, potatoes, tomatoes, and sweet potatoes. A bibliography is given of some of the more important and available publications relating to the subjects treated in the volume.

The scale insects, bark lice, and mealy bugs, C. FULLER (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 9, pp. 1031–1055, pls. 6, figs. 8*).—A large number of native species of scale insects have proved injurious in Natal and certain other species have been introduced. These species are described and notes are given on their distribution, food plants, and life history. Brief suggestions are made regarding the best method for combating scale insects.

Control of scale in old apple orchards, P. J. PARROTT, H. E. HODGKISS, and W. J. SCHOENE (*New York State Sta. Bul. 296, pp. 30, pls. 4*).—The experiments reported in this bulletin were carried out on old apple orchards badly infested with San José scale. Many of the trees were 50 years old and completely infested with scale. A variety of insecticides was tried with particular reference to the determination of their cost and effectiveness.

The amount of material applied per tree varied from 5 gal. of crude oil alone to 22 gal. of a sulphur wash followed with oil emulsion. The cost of treatment varied from 21 to 88 cts. per tree according to the insecticide used and the method of application. The sprays recommended on the basis of these experiments for the control of the scale are sulphur washes, homemade oil emulsions, and proprietary miscible oils, the first two being preferable, all things considered.

It was conclusively shown that scale insects may be profitably controlled on peach, plum, pear, and apple trees, even after these have been allowed to become badly infested. No serious injury was observed from the use of any of the insecticides. On the basis of efficiency, cheapness, and safety, boiled lime-sulphur wash and homemade oil emulsions proved most satisfactory and it is believed that the annual application of either of these insecticides will give the desired results.

Saving old orchards from scale, F. H. HALL (*New York State Sta. Bul. 296, popular ed., pp. 10, fig. 1*).—A popular edition of the above.

White fly in California, C. W. WOODWORTH (*California Sta. Circ. 30, pp. 16, figs. 12*).—California has previously been free from white fly but it has now appeared in citrus orchards in Marysville. It is believed that the fly has been present in this locality for fully a year. Attention is called to the great destruction which this insect may cause in citrus orchards and to the necessity of vigorous work along the line of eradication in view of the apparent limited distribution of the pest at the present time. The life history and habits of the white fly are described.

White fly eradication, C. W. WOODWORTH (*California Sta. Circ. 32, pp. 15, figs. 11, map 1*).—Soon after the discovery of the presence of white fly in Marysville, California, a vigorous campaign of eradication was undertaken, dependence being placed largely on defoliation of citrus trees and other trees upon which the white fly feeds. In some cases the work was well done but many instances of bad practice were noted. An especial complaint is made of delaying the work until the flies were on the wing and could, therefore, make their escape to other trees. The brush and leaves removed from orchards were allowed to remain in heaps too long or were scattered about the streets and therefore permitted the reinfestation of the orchards.

In organizing a campaign for the eradication of this pest the author suggests the appointment of a horticultural staff to assist the orchardist in restoring to a bearing condition the stumps of trees which were defoliated. Another staff of inspectors is suggested with the duty of determining the exact distribution of the white fly and a third staff of investigators to work out the life history of the fly under California conditions. This work may be done in summer. For the winter a thorough campaign of defoliation, cleaning up, and disposing of infested material is recommended.

Use of heat in treating coffee trees for borers, L. Boutan (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 21, pp. 883–885*).—Torches in which the heat was furnished by leaves have been used in attempts to heat the branches of coffee trees to a sufficient temperature to kill *Xylotrechus quadrupes*. The efficacy of this method is called in question by the author, whose experiments indicate that a temperature of 45 to 47° C. for several hours is required to kill the borer. At a temperature of 60° C. the insect dies within 5 minutes. A temperature of 45° C. does not appear to injure the coffee trees and an apparatus is described by means of which this temperature may be produced in the tree for the purpose of destroying the borer.

The grapevine root-borer, F. E. Brooks (*West Virginia Sta. Bul. 110, pp. 19–30, pls. 5*).—The grapevine root-borer was found in Upshur County in West Virginia infesting the roots of all varieties of cultivated grapes and also of the fox grape. Infested vines are not necessarily killed by the insect, but are greatly enfeebled. A detailed description is given of the insect in its various stages. Each female moth lays about 400 eggs. The larvæ penetrate into the soil sometimes to a depth of 11 in. and occasionally as far as 9 ft. from the base of the plant before entering the roots. The larval stage extends over a period of 21 or 22 months.

Crested flycatchers were observed feeding upon moths and king birds were also seen in infested vineyards. The larvæ of *Photuris pennsylvanica* prey upon the pupæ of the grapevine root-borer. The use of wire netting or wood veneer wrappers about grapevine trunks is of no avail. In most cases digging out the borers is also impracticable, but if adopted should be done in October or November. There appears to be no immune variety except perhaps the Scuppernong. The moths may be destroyed by hand, but the best results are obtained from thorough cultivation in June and July to destroy the pupæ which are then located near the surface of the soil.

Insects affecting rubber plants, J. Kotinsky (*Hawaii. Forester and Agr., 4* (*1907*), *No. 10, pp. 304–308*).—The chief insect pests of rubber plants in Hawaii appeared to be *Saissetia nigra*, *Pseudococcus virgatus*, and undetermined species of mites and plant lice. Brief notes are also given on the chief insect pests of rubber in Mexico, Central America, India, and Ceylon. Apparently Hawaii is thus far free from serious pests of rubber.

The nut weevil, F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Circ. 99, pp. 15, figs. 14*).—This is a reprint from the Yearbook of this Department for 1904 (E. S. R., 17, p. 162).

A new bark beetle, G. Fuchs (*München. Koleopterol. Ztschr., 3* (*1906*), *No. 1, pp. 51–55, figs. 2*).—A technical description is given of *Hylesinus orni* which was found in the bark of *Fraxinus ornus*. The life history of this insect is briefly described and illustrations are given of its burrows.

Mosquito life, Evelyn G. Mitchell (*New York and London, 1907, pp. XVII+281, pls. 9, figs. 54*).—In this volume the author has attempted to give a general account of the biology, economic importance, and means of combating mosquitoes. The stages of the important species of mosquitoes have been studied anew and analytical tables are presented for the identification of mosquitoes in their different stages. A list is also given of the genera and species of mosquitoes.

Particular attention is given to the economic aspects of mosquito life and to their connection with the distribution of disease.

The ticks infesting domesticated animals in India, C. Warburton (*Imp. Dept. Agr. India Bul. 6, pp. 13, figs. 15*).—Descriptive notes are given on the ticks which are commonly found on cattle, horses, and dogs in India. The material upon which these notes are based was collected from all parts of India and is believed to be representative. The species to which attention is given includes *Argas persicus* and others.

Ticks as carriers of Texas fever (*Bol. Agr.* [*São Paulo*], *8. ser., 1907, No. 8, pp. 380-384, fig. 1*).—Brief descriptive notes are given of *Boophilus annulatus*, *B. australis*, and *Pirosoma bigeminum*. Mention is also made of the beneficial effects which have followed the use of arsenical and kerosene applications in destroying ticks.

Botflies of the horse, E. L. Vallejo (*Com. Par. Agr.* [*Mexico*], *Circ. 65, pp. 10, pls. 2, figs. 10*).—The life history of the botfly is described and an account is given of its parasitism on the horse, where ordinarily it does not cause serious injury. Various internal remedies have been tried, such as carbon bisulphid and sulphuric ether, but without satisfactory results.

A new myxomycete parasitic in insects, L. Léger (*Compt. Rend. Acad. Sci.* [*Paris*], *145* (*1907*), *No. 20, pp. 837, 838*).—The author describes as a new species and new genus under the name *Sporomyxa scauri*, a myxomycete which is parasitic in various organs of insects particularly *Scaurus tristis*. Infected organs are recognizable under low magnification by the presence of numerous ovoid and transparent spores isolated or in groups in the tissues. The vegetative stages of the parasite are so transparent as to be almost invisible without staining. The parasitic myxomycete is described and brief notes are given on its apparent systematic position.

An absolutely sure method of preservation of natural scientific collections against insect enemies, G. W. Bock (*Ent. News, 18* (*1907*), *No. 10, pp. 443, 444*).—According to the experience of the author insect collections may be protected against insect pests by first fumigating the boxes with carbon bisulphid and then placing in the closed boxes a small piece of cotton saturated with coal-tar creosote.

Insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms Rpts. 1906, pp. 181-184*).—Chemical analyses were made of a number of new forms of kerosene emulsion containing caustic soda, copper sulphate, and other ingredients.

During recent years the results obtained from the use of copper sulphate in the control of wheat smut have not been satisfactory. The suspicion, therefore, arose that the commercial form of this substance was not up to standard. Analyses were made of a number of samples of copper sulphate none of which appeared to reveal the presence of any adulteration. Copper sulphate as found on the market is not always strictly pure but apparently does not contain any deliberate addition. The white efflorescent sometimes found on crystals in copper sulphate indicate the loss of the water of crystallization on exposure to air.

Report on further experiments on sulphur dioxid as applied in the destruction of rats and in disinfection on shipboard, J. Wade (*Ann. Rpt. Local Govt. Bd.* [*Gt. Brit.*], *35* (*1905-6*), *pp. 476-542, figs. 11*).—An extensive series of experiments was carried out in testing the efficacy of sulphur dioxid for destroying rats and insects on shipboard, and also in determining its possible injurious effect upon foodstuffs and other materials.

It was found that rats and most insects are destroyed within 8 to 12 hours in an atmosphere containing 3 per cent of sulphur dioxid, and most pathogenic bacteria are destroyed during the same treatment if freely exposed. Fabrics, metals, and articles of furniture are not affected by fumigation unless sulphuric acid is formed by a combination of gas with water. In order to prevent this it is recommended that such materials be protected with a suitable covering.

Moist foodstuffs, including fruit, vegetables, and fresh meats, are badly affected or even rendered uneatable after exposure to sulphur dioxid. Wheat in bags is also injured, but not barley or corn. The gas for use in fumigation may be generated from liquefied gas or by burning sulphur.

The abuse of poisons in agriculture, A. ANDOUARD (*Ann. Soc. Acad. Nantes, 8. ser., 7 (1906), pp. 169–177*).—A complaint is made of the excessive use of arsenical, mercurial, and other dangerous poisons. It is argued that the presence of these poisons is a source of danger and that their continual use may lead to injurious effects. The suggestion is made that phenols, oils, soaps, nicotine, and other remedies are efficient in the destruction of insects and do not contain the element of danger.

FOODS—HUMAN NUTRITION.

Wheat and flour investigations, R. W. THATCHER (*Washington Sta. Bul. 84, pp. 48, figs. 3*).—The investigation reported includes the results of analyses of 86 samples of Washington wheats (crop of 1905) and milling and baking tests. The samples represented 19 varieties and 24 different localities.

The author summarizes the results as follows:

"The analyses of the wheats themselves show that within any given variety of wheat there are wide variations in chemical composition, due, apparently, to the differences in climatic conditions existing in the different localities where the wheat was grown; and that, while there are very considerable differences in favor of one variety or another in average composition, within the same variety there appear individual samples of higher or lower value than the average of any of the other varieties.

"Milling tests of each of the samples received show that the percentage yield of bran, shorts, and 'straight' flour did not vary greatly, either in the case of different samples of the same variety of wheat, or in the average yields of the different varieties.

"Analyses to show the distribution of the protein of the wheat among the mill-products obtained from it, seem to prove that among the bread wheats the proportion of the total protein which goes into the flour does not vary greatly; but that the food, or feeding, value of the several products is controlled almost wholly by the composition of the grain from which they are milled.

"Determinations of the amount of wet and dry gluten yielded by the flour from each of the samples show that the percentage of dry gluten obtained is generally slightly lower than the percentage of protein contained in the flour, the greatest differences being obtained in samples of the lowest protein content.

"Determinations of the percentage of gliadin, and sponge baking tests of 28 representative samples of these flours indicate that the 'baker's sponge test' is of little or no value in judging of the quality of the gluten of a flour; that the 'gliadin number' of Washington wheats is lower than that of eastern grown wheats, but that poor quality of gluten in our wheats is more apt to be due to a deficiency in glutenin than in gliadin; and that the flours producing the largest and best loaves of bread came from wheats which were grown in the driest sections of the State where the effects of the hot winds during harvest were felt most severely, but that this difference in baking qualities was not wholly due to differences in the percentages of protein in the grain, or of gluten which the flour would yield.

"The investigations are to be continued through several years, in order that the conclusions may not be erroneously affected by the climatic conditions of any given season, and are to be extended to include attempts to improve the quality of some of the wheats which give large yields of grain of poor milling qualities."

Comparative milling and baking tests with domestic and foreign wheat, K. Windisch and K. Pulvermüller (*Fühling's Landw. Ztg., 56 (1907), Nos. 17, pp. 577–589; 18, pp. 616–633; 19, pp. 650–669*).—According to the authors' investigations, foreign wheat was drier, harder, more translucent, and contained a higher protein content than Württemberg grain though it had a lower ash content. The yield of bread from foreign grain was somewhat greater, yet the author considers that grinding Württemberg wheat was more profitable for the miller.

The cause of coloration in dark wheat bread, G. Bertrand and W. Muttermilch (*Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 25, pp. 1444–1446*).—According to the authors' investigations, the color of "black" wheat bread is due to two diastatic processes, in the first of which a substance is formed and in the second of which it is oxidized. The wheat bran is the source of this coloring matter and for the protease which causes the coloration the name "glutenase" is proposed.

Corn bread, E. Collin (*Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 16–17, pp. 956–960, figs. 2*).—The microscopical characteristics of wheat and corn bread are described with a view to the identification of corn meal.

Adulterating flour with talc, Eury and Cailloux (*Bul. Sci. Pharmacol., 14 (1907), pp. 249–252; abs. in Chem. Zentbl., 1907, II, No. 14, p. 1187*).—Talc was found in coarse wheat flour designed as a feeding stuff and in flour for bread making. The authors point out that it is difficult to separate gluten in such materials and that it can not be separated when 15 to 20 per cent of talc is present. The reported data are discussed with reference to the detection of adulteration.

Banana flour, L. Kindt (*Tropenpflanzer, 11 (1907), No. 7, pp. 474–477*).—The domestic manufacture of banana flour in the Tropics, its value as a baby food, and related questions are discussed on the basis of personal experience.

According to the author, although green bananas are used, the best flour is made from bananas which are dry and mealy when ripe. The juicier bananas and the red varieties are not considered so satisfactory. The sliced bananas should be frequently turned and 2 or 3 days' exposure to the tropical sun is sufficient to dry them. When used as an infant food the flour should be passed through a fine sieve. The author states that children take banana flour readily though adults do not care for it on account of its pronounced violet-like flavor.

The specific gravity of raw and cooked meat, Nawiasky (*Arch. Hyg., 62 (1907), No. 2, pp. 147–151*).—According to the author's determinations, fresh meat had a lower specific gravity than boiled.

Nutritive requirements of meat exported from Argentina to England, S. G. Uriburu (*Rev. Mens. Cám. Merc., 7 (1907), No. 81, pp. 646–652*).—Data are reported regarding the composition and digestibility of frozen meat and meat products received in England from Argentina.

The Federal meat-inspection service, A. D. Melvin (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 65–100, pls. 15, fig. 1; Circ. 125, pp. 40, pls. 15, fig. 1*).—An historical and critical discussion of meat inspection in the United States. Among the topics treated are the development of the packing industry, the foreign restrictions on American live stock and meats, the first Federal meat-inspection law and later laws, a description of meat inspection as practiced, safeguards on inspection, personnel of the inspection force, the need of supplementing the Federal inspection by State or municipal inspection, and meat inspection in European countries, the article as a whole constituting a valuable summary and discussion of the subject.

Preserved soups (*Pure Products, 3 (1907), Nos. 8, pp. 373-375; 9, pp. 424-426*).—The manufacture of soup tablets, pea sausages, and similar goods is described and formulas are given.

Choucrout (Sauerkraut) (*Pure Products, 3 (1907), No. 11, pp. 516-519*).—Directions are given for making sauerkraut in quantity.

Concerning the chemical composition of Japanese soy sauce or schoyu, U. SUZUKI, K. ASO, and H. MITARAI (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 4, pp. 477-494*).—According to the authors' results the following constituents were separated from 2 liters of soy sauce: Alanin 6.6 gm. of which 1.6 gm. was pure, leucin 6 gm., prolin 3 gm., lysin 2.6 gm., ammonia 4.2 gm., protein 5.4 gm., formic acid 0.1 gm., acetic acid 0.4 gm., lactic acid 3.2 gm., and 2 new bases 1 gm. and 0.2 gm., respectively. The presence of tyrosin, aspartic acid, polypeptid like bodies, and cystin was also demonstrated.

Concerning the distribution of anhydro-oxy-methylen-diphosphoric acid salts or phytin in plants, U. SUZUKI and K. YOSHIMURA (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 4, pp. 495-502*).—The authors report studies of the character and distribution of phosphorus compounds and the amount of phytin in a number of materials, including rice bran, wheat bran, sesame seed, castor bean, rape-seed cake, bald barley and millet, steamed bean meal, and chicken bone. A comparison of methods of estimating phosphoric acid in plant extracts was also made.

Concerning an enzym "phytase," which causes cleavage of anhydro-oxy-methylen-diphosphoric acid, U. SUZUKI, K. YOSHIMURA, and M. TAKAISHI (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 4, pp. 503-512*).—The conclusions drawn from investigations reported in this and the foregoing article are in effect as follows:

The greater part of the phosphorus in seeds consists of an organic compound soluble in water and dilute mineral acids, and is the body which is designated anhydro-oxy-methylen-diphosphoric acid or phytin. Some 8 per cent of phytin was isolated from rice bran and 2 per cent from wheat bran. In roots, bulbs, and fruits inorganic phosphorus is the more characteristic constituent. The occurrence of phytin in bones is doubtful. During germination, either in light or darkness, the inorganic phosphoric acid in seeds increases. If rice bran or wheat bran or certain seeds are pulverized and suspended in water for several days phosphoric acid is formed in considerable quantities at the expense of phytin.

A ferment was isolated from rice bran and from wheat bran which splits phytin into phosphoric acid and inosit. It is apparently a new enzym and seems to be widely distributed in the vegetable kingdom.

Cane sugar v. beet sugar, G. W. SHAW (*California Sta. Circ. 33, pp. 4-8, figs. 3*).—Owing to an opinion sometimes expressed that beet sugar is not as satisfactory for making preserves and jellies as cane sugar, the question was studied under commercial and domestic conditions.

Of 2,000 cans of cherries, apricots, plums, peaches, and pears prepared with sirups of different strengths and stored for 2 years in cases under rather unfavorable conditions only 6 cans from the beet-sugar lot and 7 cans from the cane-sugar lot were found to be spoiled, evidently owing to imperfect sealing. This shows, according to the author, "the utter lack of foundation for the idea that fruits do not keep well when preserved with beet sugar, and that such sugar does not work well in the cannery."

In making the sirups for the commercial canning test it was found that there was more frothing with the beet sugar than with the cane sugar, but a further study of this point led to the conclusion that this was due to the finer granulation of the beet sugar and hence to the occlusion of more air than was the case with cane sugar. When cane sugar of a similar degree of fineness was used in an additional test, the frothing was the same as with the beet product. "This is not an essential difference between these sugars, however, as the character of the granulation is entirely dependent upon the wish of the manufacturer, the methods of boiling and granulation being the same in both cases. The sugar ordinarily used by canners is known as dry, coarse, granulated—a grade which is not commonly made by the beet-sugar manufacturers, because there has not yet been the demand sufficient to warrant its production."

In the household trials apricots and peaches were canned in 40 per cent sirup of each kind of sugar and ordinary glass jars were used. Not a single one of the 50 cans of each lot spoiled in the 2 years in which they were kept under observation.

In the jelly-making trials apples and currants were the fruits selected, and equal quantities of sugar and fruit juice were used, the mixture being boiled until of the right consistency to jelly. With both cane sugar and beet sugar the product "was as clear as it is possible for jelly to be, and not the slightest difficulty was experienced in the making of it."

From experimental evidence and other data the author concludes that there is no warrant for the belief that beet sugar is not satisfactory for preserving and jelly making.

Packing prunes in cans, G. W. Shaw (*California Sta. Circ. 33, pp. 1–3*).—Prunes packed in the ordinary way are apt to sugar when sent to tropical countries or stored under certain unfavorable conditions. With a view to obviating this difficulty prunes of excellent quality were packed in hermetically sealed cans and sterilized by the application of heat. It was found that such goods kept well when sent to the Philippines or when tested for about 2 years in other ways under unfavorable conditions. In the author's opinion, the extra cost to the manufacturer of handling prunes in this way is offset by the extra amount of moisture which the fruit carries "and there will hardly be an increase in the cost of handling the fruit in so packing it over that of a processed fruit, because it will do away with the necessity of the handling due to that operation and also with the cost of the materials used in 'processing.' Prunes so packed and sealed can be guarantied and kept indefinitely without deterioration or 'sugaring.' One of the great advantages of this process is, that the grower can pack his fruit in either the dried or partially dried condition with absolute assurance of delivery to the market in exactly the same condition in which it leaves his hands."

Chemist's report, F. W. Robison (*Mich. State Dairy and Food Dept. Buls. 138–142, pp. 12–59*).—Under the provisions of the State pure-food law 872 samples of spices, preserved fruits, canned goods, etc., were examined and 311 were found to be adulterated.

Food analyses, C. F. Juritz (*Rpt. Senior. Anal. Cape Good Hope, 1906, pp. 5–20*).—Out of a total of 1,510 samples of dairy products, jams, beverages, spices, etc., 290 were found to be adulterated. The article contains data regarding the government food-inspection work.

Maple sugar, 1907, A. McGill and A. Valin (*Lab. Inland Rev. Dept. [Canada] Bul. 140, pp. 25*).—Of 257 samples of maple sugar purchased in the Canadian market, 185 were found to be genuine while 10 were doubtful. Of the remainder, 57 were adulterated and 5 were declared mixtures.

Maple sirup, A. McGill and A. Valin (*Lab. Inland Rev. Dept.* [*Canada*] *Bul. 141, pp. 21*).—Of 244 samples of maple sirup examined, 187 were genuine and 2 doubtful.

Tea, 1906, T. Macfarlane (*Lab. Inland Rev. Dept.* [*Canada*] *Bul. 130, pp. 13*).—Of 89 samples of tea collected in the Canadian provinces, examination showed that 82 were genuine and the remainder doubtful.

Ground ginger, A. McGill (*Lab. Inland Rev. Dept.* [*Canada*] *Bul. 137, pp. 7*).—Examination of 30 samples of ground ginger found in the Canadian market showed that 29 were genuine while adulteration was not absolutely certain in the remaining sample.

Almond flavoring extracts, A. Lemoine (*Lab. Inland Rev. Dept.* [*Canada*] *Bul. 136, pp. 10*).—Of 65 samples of almond extract examined, 61 were entirely free from prussic acid, 3 contained measurable amounts, and 1 a trace only. Nine of the samples contained added dyes.

Spirituous liquors, A. McGill (*Lab. Inland Rev. Dept.* [*Canada*] *Bul. 135, pp. 9*).—A report of the examination of 66 Canadian samples.

Report of the sixth convention of the Association of German Food Chemists (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14* (*1907*), *No. 1-2, pp. 1-203*).—This report contains the proceedings of the convention, papers presented, and discussions. Among the papers summarized may be mentioned Fruit Juices, Marmalades, etc., by W. Fresenius; Standards of Official Chemists in Saxony for Marmalades, by F. Härtel; Subsistence of the Roman Soldiers in Germany, by H. Dragendorff; Recommendations for Changes in the Methods for the Analysis of Honey, by E. von Raumer; What Recommendations Shall Be Made with Respect to Alcohol-free Beverages? by A. Beythien; and Effervescent Lemonades, by A. Beythien. Other papers have been previously noted (E. S. R., 19, p. 611).

Nutrition of laborers, R. Martial (*Rev. Hyg. et Pol. Sanit., 29* (*1907*), *No. 6, pp. 514-528*).—In the author's opinion, the estimates which have been published regarding the cost of food of Parisian laborers are too low and data are presented which show that the average expenditure in such a family of 3 persons amounts to 33 cts. per person per day.

Experiments on the nutritive value of maize, N. O. Popovici-Lupa (*Bul. Soc. Sci. Bucarest, 14* (*1905*), *pp. 86-113*; *abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 14* (*1907*), *No. 7, p. 488*).—The author studied the diet of Roumanian peasants, which is made up principally of maize, beans, and cabbage. Though such a diet supplies less potassium than an ordinary mixed diet it is not regarded as deficient in this constituent. The protein supplied by the vegetarian diet studied is regarded as sufficient for bodily needs.

The nutritive value of gelatin. II, Significance of glycocoll and carbohydrate in sparing the body's proteid, J. R. Murlin (*Amer. Jour. Physiol., 20* (*1907*), *No. 1, pp. 234-258*).—Experiments with man and animals are reported in continuation of earlier work (E. S. R., 19, p. 768), which led to the following conclusions:

"The well-known action of gelatin to protect the body's proteid is not due to the influence of any dextrose which may be synthesized from it in the course of metabolism. Its value as a proteid-sparing agent must consist in the fact that it contains nitrogenous bodies.

"Glycocoll, which is the chief amino acid contained in gelatin, when fed with abundant carbohydrate, either as the only source of nitrogen or together with proteid (beef heart), can be retained temporarily in the body. This fact may serve in part to explain the unusually high replacement of proteid by gelatin, with maintenance of nitrogen equilibrium. . . . The fact that glycocoll can not be retained permanently, even with large quantities of carbohydrate available, may serve in part to explain the inadequacy of gelatin as a source of nitrogen, and must be taken into account in any attempt to 'restore' gelatin to full proteid value.

"A specific relationship has been shown to exist between carbohydrates ingested and the elimination of nitrogen (or protein metabolism, as measured by nitrogen output). Carbohydrate, not needed for combustion (extra metabolic) is far more efficacious in reducing the nitrogen output (therefore favoring the retention of proteid) than carbohydrate coming within the requirement for potential energy. This fact indicates the importance of abundant carbohydrates for convalescence and growth, and may explain the almost universal craving for sweets, especially in the young."

The digestibility of mannans by diastase found in higher animals, GATIN and MME. GATIN (*Bul. Sci. Pharmacol., 14 (1907), pp. 447–452; abs. in Chem. Zentbl., 1907, II, No. 14, p. 1181*).—From artificial digestion experiments with Japanese edible algæ, the authors conclude that the mannans present are not digested by man and higher animals. Their favorable effect on peristaltic action is regarded as a possible explanation of their value in dietetics.

Concerning carbohydrate metabolism, K. SPIRO (*Beitr. Chem. Physiol. u. Path., 10 (1907), No. 7–8, pp. 277–286, fig. 1*).—From the experimental data reported the author concludes that protein and carbohydrate cleavage go hand in hand and that the intermediate metabolic products obtained are not the same when these foods are taken together as when they are taken singly.

The influence of food preservatives and artificial colors on digestion and health. III, Sulphurous acid and sulphites, H. W. WILEY, W. D. BIGELOW, F. C. WEBER, ET AL. (*U. S. Dept. Agr., Bur. Chem. Bul. 84, pt. 3, pp. VI+761–1041, figs. 3*).—A full report of the experimental data on the effects of sulphurous acids and sulphites carried on as a part of the studies on the effect of food preservatives on health.

This work, which has been noted from a summary previously published (E. S. R., 19, p. 668), led to the general conclusion that "the verdict which must be pronounced in this case is decidedly unfavorable to the use of this preservative in any quantity or for any period of time, and shows the desirability of avoiding the addition of any form of sulphurous acid to products intended for human food."

Review of the literature of composition, analysis, and adulteration of foods for the year 1906, A. J. J. VANDEVELDE (*Separate from Bul. Serv. Surveill. Fabric. et Com. Denrées Aliment., 1907, pp. 129*).—As in earlier publications of this series (E. S. R., 18, p. 362), the subjects include general articles, apparatus, water, milk and cream, fats and oils, cheese, cereals and cereal products, spices, sugar, sirup, etc., vinegar, fruits and vegetables, adulteration, and similar topics. Bibliographical data in many cases are supplemented by short abstracts.

ANIMAL PRODUCTION.

Fodders and feeding stuffs, F. T. SHUTT (*Canada Expt. Farms Rpts. 1906, pp. 164–175*).—The feeding stuffs analyzed included oat middlings, oat dust, oat feed, oatmeal, corn bran, gluten feed, glucose feed, rice meal, cottonseed meal, malt sprouts, molasses feeds, beet-root feed, crushed screenings, mixed feeds, ground middlings, wild buckwheat, screenings from flax and wheat (whole and ground), ground screenings mixed with barley, flax chaff, buckwheat chaff, fine broken stock, and wheat chaff. Analyses are also reported of apple pomace, meat meals for poultry, frozen and unfrozen wheat straw and chaff, and of a number of samples of mangels, turnips, carrots, and sugar beets.

As shown by the data for frozen straw and chaff, "the frozen straw contains 0.63 per cent or about one-seventh more protein than the straw from the unfrozen, fully ripened grain; and, similarly, we find in the frozen chaff a higher protein content (about 0.39 per cent) than in that from the fully matured wheat. Since the cattle prefer the frozen straw there can be no doubt about its greater palatability. This is partly due to its being less hard and possibly in part to the development of a certain amount of sugar by the frost—a point unfortunately overlooked at the time of analysis, but upon which it is intended to obtain data on some future occasion. It may further be supposed that the digestibility of the immature straw will be somewhat higher than that from the fully ripened grain. . . .

"As to the comparative feeding value of the straw and chaff from the same crop, the writer is of the opinion that while the former is slightly richer in protein and fat, the latter, by reason of its lower fiber and the fact that it is more readily eaten by stock, is practically, the more valuable fodder."

Concentrated commercial feeding stuffs, J. D. TURNER (*Kentucky Sta. Bul. 131, pp. 51–107*).—The State feeding stuff law is quoted and the results of a number of analyses made under its provisions are reported of the following feeding stuffs: Wheat bran, wheat middlings, wheat shorts, ship stuff, wheat bran and ship stuff, corn bran, corn chops, corn meal, hominy meal and other corn products, cotton-seed meal, linseed meal, mill run, mill feed, mixed and proprietary feeds, gluten feed, and poultry feeds. An undue proportion of corn product was found in a number of samples of wheat products but in general the concentrated feeds were of good quality.

Commercial feeding stuffs, J. L. HILLS, C. H. JONES, and C. CUTLER (*Vermont Sta. Bul. 133, pp. 25–32*).—The feeding stuffs examined under the State law included cotton-seed meal, linseed meal, gluten feeds, dried distillers' grains, dried brewers' grains, flax feed, molasses feed, oat feeds, alfalfa products, wheat brans, wheat middlings, mixed wheat feeds, red-dog flour, provenders, and proprietary feeds.

The cotton-seed meal, linseed meal, and oat feeds were in accord with the guaranty. Practically all the wheat brans and other wheat products were of good quality, as were also the provenders. The flax feeds, which are, according to the authors, new in New England, are composed of "broken flaxseed, straw, and many seeds and screenings, some samples be'ng very clean and others quite the reverse." A number of samples of molasses feeds and flax feeds contained large amounts of weed seeds capable of germination, as was shown by special germination tests.

The analytical data reported cover guarantied feeds only.

Licensed commercial feeding stuffs, 1907, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Bul. 157, pp. 54, fig. 1*).—Analyses are reported of feeding stuffs licensed under the State law and also of flour-mill feeds, of materials not subject to guaranty, and of a number of samples of unlicensed and miscellaneous feeds.

The licensed feeds included oil meals, gluten feeds, corn feeds and similar goods, mixed corn and oat feeds, commercial dairy feeds, and animal meal and poultry feeds and similar goods. The feeding stuffs not subject to license included wheat bran, wheat middlings, and corn and oat mixtures. The unlicensed and miscellaneous commercial feeds included flax flakes, flax feed, cotton-seed meal, hominy feed, rice bran, dairy feed, special poultry feeds, granulated milk, distillers' grains, sugar feed, gluten cake, mustard cake, mustard-seed bran or feed, flax screenings, wheat screenings, corn screenings, corn meal, oat meal, oat shorts, rye flour, red-dog flour, rye middlings, barley feed, pea hulls, and mixed and proprietary feeds.

A number of samples of different brands were found to be deficient in protein or fat or both, but the authors consider that on the whole a marked improvement is noticeable over previous years. "It is evident that the various manufacturers have of late years paid much more attention to the chemical composition of the feeds which they put on the market than was the case during the first years of feed-inspection work in the State.

The State feeding-stuff law is quoted, including an amendment in force after January 1, 1908, to the effect that all mill feeds and malt sprouts, except when they are sold locally by the manufacturer himself, are to be included under the provisions of the law.

Investigations in animal nutrition, H. P. Armsby (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 263–285, pls. 3, figs. 2*).—The respiration calorimeter used in the experiments carried on at the Pennsylvania State College Institute of Animal Nutrition in cooperation with this Department is described. experimental methods are discussed, and some of the results obtained with steers are summarized. The investigations have been noted from earlier publications (E. S. R., 18, p. 508).

Miscellaneous information concerning the live-stock industry in 1906 (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 309–326*).—Statistical data are summarized regarding market prices of live stock, movement of live stock, live stock exhibitions, the registered live stock in the United States, and certified pedigree record associations.

The King system of stable ventilation, W. H. Jordan (*New York State Sta. Circ. 7, n. ser., pp. 2, figs. 5; reprinted in New York State Sta. Rpt. 1906, p. 106, pls. 3*).—This system of stable ventilation (E. S. R., 11, p. 595) is described as installed at the New York State Station.

Fattening cattle for the market, H. J. Waters (*Missouri Sta. Bul. 76, pp. 141, figs. 19*).—On the basis of answers received to a circular letter sent to about a thousand successful cattle feeders in Missouri, Iowa, and Illinois and a summary of station experiments on cattle feeding, the general subject is discussed in detail and many deductions are drawn regarding feeding, care, and management. The following are quotations from this summary:

"Cattle that are being fattened should be fed with the utmost regularity, should be kept as quiet as possible, and should be encouraged to lie down when not eating. They should never be frightened or disturbed in any way.

"Changes in feed, location, or surroundings of cattle that are fat should never be made, except such as are decidedly for the better, and even then should only be made when most imperative. . . . Keep constantly in mind that there are other factors than mere cost of gains which bear quite as important a relation to the profitable outcome as does this one. . . . The gains put on cattle during the fattening process cost more per pound than they bring on the market when the steer is sold. The cost of these gains will vary between 6 cts. and 10 cts. per pound, while the steer will bring on the market an average of from 4 cts. to 7 cts. per pound. This situation is not met in commerce by attempting to force the price of the finished steer to a point high enough to meet the expense of fattening directly and pay a profit, but by lowering the price at which the steer in thin condition may be purchased. The raiser of the cattle is required to sell them as feeders at a lower price per pound than the animal will bring on the market when fattened. In other words, the burden of the fattening operation has been laid upon the cattle raiser rather than upon the meat consumer.

"The amount of margin required to cover the expense of fattening and pay a profit is governed by a variety of circumstances. Younger cattle require a smaller margin than older cattle, because they make cheaper gains, short fed cattle, a smaller margin than long fed cattle, because the costs of gains is higher the longer cattle are on feed. Cattle of high quality require a narrower margin than cattle of poor quality because of the higher price at which they sell when finished. A larger margin is required in winter than in summer, because it requires more feed to make a pound of gain. The higher the price of feed, the larger the margin required, unless the price of finished cattle has correspondingly increased. . . .

"Taking the average price of all fat hogs and all the fat steers sold on the Chicago market for the past 24 years, it has been found that the hogs have brought a higher price per pound. It will be accepted without argument that less food is required to make a pound of gain on hogs than on cattle. As a rule, therefore, the hog end of the cattle-feeding operation is more profitable than the cattle end. . . .

"In the buying of the animal there is required an intimate knowledge of the whole range of cattle feeding and of market requirements with regard to different classes at different seasons of the year, etc. The business judgment developed at this point will affect very vitally the financial outcome.

"Endeavor to meet these requirements of the market. No one can hope to develop good judgment in this direction without a thorough familiarity with the various market classes of cattle and without knowing how much fat each class requires to enable it to be sold to the best advantage. It would of course be fatal to follow one rule with all grades. Cattle of good quality will require a relatively higher finish because, as a rule, their cost price as feeders is so high that there will be too small a margin between it and the selling price to pay a profit if they are not made prime."

Beef production, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1906, pp. 66–78*).—In a test undertaken to study the effect of breeding on gains, 9 steers of excellent breeding and conformation made an average daily gain of 2.02 lbs. at a cost of 7.64 cts. per pound in a 116-day period. Eight similar animals of good breeding and very fair conformation gained 2.26 lbs. per head per day at a cost of 6.72 cts. per pound, and 8 animals of mongrel breeding and poor conformation gained 1.82 lbs. per head per day at a cost of 8.6 cts. per pound under similar conditions of feeding and care.

In a second series of tests, 7 steers of good conformation and quality gained 2.36 lbs. per head per day at a cost of 4.26 cts. per pound in 180 days, while a like number of inferior steers gained 2.27 lbs. per head per day, the gain costing 4.97 cts. per pound.

In a study of the possibility of profitably feeding beef in stable, a lot of 10 animals in 92 days made an average daily gain of 2.21 lbs. per steer at a cost of 6.37 cts. per pound. A similar lot of 10 animals in 116 days gained 2.46 lbs. per head per day at a cost of 4.52 cts. per pound. Both lots were fed meal, silage and roots, and hay.

A second test of long and short feeding periods was made, in which 7 steers fed 180 days gained 2.36 lbs. per head per day at a cost of 4.26 cts., while a similar lot of 8 animals fed 130 days gained at the rate of 2.08 lbs. per head per day at a cost of 4.58 cts. per pound.

Tests with lots containing 5 or 6 steers and extending over 2 or 3 years are reported in which limited and full fattening rations were studied in connection with the question of raising baby beef, the limited rations being fed from 284 to 743 days and the full fattening rations from 213 to 414 days. On the limited rations the greatest gain was 1.65 lbs. per head per day and the smallest, 1.42 lbs., the cost of a pound of gain ranging from 3.13 cts. with the latter lot to 4.85 cts. per pound with the former lot.' On the full fattening ration the greatest gain was 2.1 lbs. per head per day at a cost of 4.14 cts. per pound and the smallest gain, 1.49 lbs. per head per day, at a cost of 3.18 cts. per pound.

Experiments in feeding steers, N. Wolverton (*Canada Expt. Farms Rpts. 1906, pp. 321, 322*).—A steer feeding test at the Manitoba experimental farm in which fodder corn and oat sheaves were compared, is briefly reported. On the corn ration the average daily gain with 4 steers was 1 lb. 6 oz. in 143 days and the profit $6.93 per steer. In the case of the oat sheaf group the values were 1 lb. 8 oz. and $6.10.

Feeding tests, A. Mackay (*Canada Expt. Farms Rpts. 1906, pp. 370–372, pl. 1*).—In a test undertaken at the Indian Head experimental farm to determine the effect of age on beef production, it was found that the average gain of 3 yearling steers in 16 weeks was 150 lbs. per head and of 2 2-year-olds 245 lbs. per head.

In a comparison made with 5 2-year-olds and 7 3-year-olds, the average gain in 16 weeks was 211 and 166 lbs. per head, respectively. Of these two lots the calculated profit was $6.74 and $4.67.

Fattening range lambs, B. E. Carmichael (*Ohio Sta. Bul. 187, pp. 7–35, figs. 8*).—Continuing earlier work (E. S. R., 18, p. 974), a proprietary stock feed was compared with linseed meal for fattening lambs, as were medium and heavy rations and the relative gains made by ewes and wether lambs. The question of the manure production was also studied. Four lots, each containing 44 lambs, ewes and wethers together, were used and all were fed clover hay in addition to concentrated feed. The grain rations fed and the average daily gain per lamb in the 16 weeks of the test were corn and linseed meal 5:1, 0.236 lb.; corn and condimental stock feed, 0.234 lb.; heavy corn ration, 0.244 lb., and medium corn ration, 0.231 lb. The cost of feed per pound of gain on the 4 rations was 7.07, 6.58, 6.12, and 6.29 cts. The shrinkage in shipment and the percentage dressed weight were recorded but no striking differences were noted with the different lots. On an average the commercial value of the manure produced ranged from $29.31 with the lot fed the heavy corn ration to $34.81 with the lot fed corn and linseed meal. The fertilizer value of the manures was determined.

In a discussion of this and earlier work at the station, the author concludes that the rations were not markedly different as regards the feed required per pound of gain and that it was not possible on the basis of these tests to determine whether the stock feed was either beneficial or harmful as the variations noted with the ration containing it were not marked.

"The results of one experiment [1906–7] indicate that lambs fed upon a heavy grain ration will produce gains with a lower consumption of feed than will lambs fed upon a moderate grain ration. The plan of the test, however, was interfered with somewhat and further work is needed before definite conclusions may safely be drawn.

"Wethers made approximately 10 per cent greater gains in live weight than did ewes. . . .

"Data secured show that manure from fattening lambs has a very high fertilizing value, on the basis of its nitrogen, phosphoric acid, and potash content.

"The manure from the lots fed cotton-seed meal or linseed-oil meal, carried in every instance more nitrogen, phosphoric acid, and potash than did that from the lots fed a grain ration consisting solely of corn. In both experiments the added value of the manure was more than offset by the increased cost of the linseed-oil meal or cotton-seed meal. The increased value of the manure produced from different feeds is worthy of consideration, since market conditions might vary sufficiently to justify the feeding of linseed-oil meal or of cottonseed meal from the standpoint of manure production alone."

Swine feeding, J. H. Grisdale (*Canada Expt. Farms Rpts. 1906, pp. 78–80*).—The merits of feeding a meal mixture alone and supplemented by mangels, sugar beets, and a proprietary feed were studied, using 4 lots of 4 pigs each. The meal mixture selected was made up of barley, oats, shorts, and gluten 5:2:5:2. The average daily gain per pig in the 85 days covered by the test was 0.5 lb. on meal alone, 0.55 lb. on meal and mangels, 0.7 lb. on meal and sugar beets, and 0.71 lb. on meal and the proprietary feed. The cost of a pound of gain ranged from 5.05 cts. on the sugar beet ration to 7.03 cts. on meal alone.

The Danish hog industry, A. Fossum (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 223–246*).—A summary and discussion of the Danish hog industry with special reference to breeds, breeding societies, methods of handling and curing bacons, the Danish bacon trade with England, Danish imports and exports of bacon and hams, and related questions.

Horses, J. H. Grisdale (*Canada Expt. Farms Rpts. 1906, pp. 48, 49, pls. 2*).—In a discussion of the amount of work performed by the farm horses and its value, the daily cost of feed and care is estimated at 32.5 cts. per head.

A feeding test undertaken to determine the value of a proprietary stock food for draft horses is briefly reported. Five teams were used, one horse in each team being fed the special food in accordance with directions in addition to the standard ration of 14 lbs. of oats and bran 2.5:1. "First there was some little difficulty in gettting the horses to eat up clean the mixture of oats, bran, and stock food, but they soon learned to take it without difficulty." These horses gained 12 lbs. in weight in 42 days as compared with a gain of 13 lbs. by 5 animals fed the grain ration without the special feed. "It would appear, therefore, that so far as gains in weight are concerned that the stock food was of no value whatever. So far as one could judge of condition of the horses by their appearance and by their spirit when working those not getting stock food were in no way behind their mates which were receiving stock food."

Suggestions for horse and mule raising in the South, G. M. Rommel (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 247–261; Circ. 124, pp. 15*).—As the local supply of horses and mules is inadequate, the author believes that more of these animals may be profitably raised in the southern United States. He discusses methods of breeding and management, the necessity for improvement in native stock, selection of breeding animals, the possibilities of southern mule markets, breeding mules, and related topics. The need for satisfactory and adequate feeding is emphasized.

Farm poultry, W. S. Jacobs (*Arkansas Sta. Bul. 99, pp. 149–173, figs. 17*).—Feeding, care and management, construction of poultry houses, incubators, poultry diseases, preserving eggs, and similar questions are discussed with reference to local conditions, and to a considerable extent on the basis of experience gained at the station.

In a comparison of the egg record of different breeds for a year, it was found that the average per hen for Plymouth Rocks was 141.1, for Silver Laced Wyandottes 110.16, for Single Comb White Leghorns 109.45, and for Buff Orpingtons 108.12 eggs. The cost per dozen eggs ranged from 6.51 cts. with the Leghorns to 7.02 cts. with the Plymouth Rocks.

Report of the poultry manager, A. G. Gilbert (*Canada Expt. Farms Rpts. 1906, pp. 257–272, fig. 1*).—The present condition of the poultry buildings, methods of feeding, and related questions are spoken of, as well as the incubator tests and other experimental work carried on. Some data are also given regarding the poultry stock on hand, poultry exhibited, and poultry diseases. According to the author, the hopper method of feeding poultry has been adopted and reasons for and against this practice are briefly spoken of.

In the incubator tests eggs from unheated and from warmed houses were hatched which were placed in the incubators in March, April, and May. The largest percentage of eggs which hatched was noted with the incubators filled in May, and in general the eggs from unheated houses hatched better than those from warmed houses. According to the author, the results "go to emphasize the advice given to farmers and other poultry keepers, in this and preceding reports, not to select eggs for hatching by incubator or hen until the fowls have had opportunity, in spring time, to run outside and recuperate from their long term of winter life and treatment."

Data are recorded regarding the method followed in the feeding of chickens and the dates at which the first pullets began to lay.

Warm *v.* cold houses were compared in work undertaken in connection with the founding of hardy and prolific egg-laying strains of fowls. In a warm house the average egg yield per year of 12 Barred Plymouth Rocks was 65.75 eggs per hen, and of a similar lot in an unheated house 76 eggs per hen. In a house of the same sort with a cotton front scratching shed, the average egg production of 13 White Wyandotte hens was 74.5 eggs per hen, of 9 Buff Orpington pullets in a warmed house 58 eggs per hen, and of 12 White Leghorn pullets in a warmed house 77.17 eggs per hen.

As regards the record of individuals of good and poor strains as shown by trap nests, 5 White Leghorn pullets of good strain averaged 101.4 eggs per hen in a year and 5 pullets of poor strain 77.4 eggs per hen.

The poultry industry in Oregon, J. DRYDEN (*Oregon Sta. Bul. 96, pp. 40, figs. 23*).—On the basis of observation and information secured by inquiry, the author discusses the possibilities of poultry raising under local conditions. Though poultry raising as a whole has some considerable importance in Oregon, he believes that no branch of agriculture has been so generally neglected as this, and that "the market conditions are favorable for increased production of poultry and eggs in this State. In few sections of the country are the prices of poultry and eggs better than they are in Oregon and on the Pacific coast generally. At the present time (December) fresh ranch eggs are quoted in Portland at 40 cts. per dozen wholesale, while consumers are paying as high as 50 cts. At such a price a dozen eggs will about pay for the cost of food consumed by the hen in a year when kept on a farm. The market quotations at Seattle on the north and San Francisco on the south are higher than at Portland, and these markets would take care of any possible surplus that might be produced in Oregon."

Data summarized regarding the range in price of ranch eggs in Oregon and the possibilities of markets in neighboring States are discussed, as well as such general questions as the possibilities of the poultry industry, cost of labor, poultry and mixed husbandry, climate and soils in relation to poultry keeping, and methods of housing.

The preservation of eggs, F. T. SHUTT (*Canada Expt. Farms Rpts. 1906, pp. 272, 273*).—Continuing earlier work (E. S. R., 16, p. 298) on the relative value of limewater and water glass solution for preserving eggs, a test was made in which fertilized and nonfertilized eggs preserved with these solutions were kept in stoppered bottles in the laboratory for 13 months where the temperature varied from 60 to 80° F. and averaged about 68° F.

According to the author, decidedly better results were obtained with the eggs preserved in limewater. The nonfertilized eggs were somewhat superior as regards the color of the white and the character of the yolk, but all the eggs preserved in limewater were usable for cooking purposes. When poached, the nonfertilized eggs did not have any markedly unpleasant odor or taste.

Little difference was observed between the fertilized and nonfertilized eggs preserved in water glass. In all cases the white was distinctly discolored, being pinkish red and very limpid, while the yolks were thin, discolored, and broken down. The author states that possibly 50 to 70 per cent of the eggs examined might have been used for some cooking purposes, while 30 per cent of them were thoroughly bad and totally unfit for human food. The slightly alkaline taste and odor and the "distinctly disagreeable appearance of even the best of these eggs would entirely prevent their use on the table.

"This has been, of course, a most severe test. Thirteen months at ordinary room temperatures constitute conditions not frequently required to be met, yet the saturated limewater has under them proved itself a very satisfactory preservative and more especially so when the eggs are nonfertilized."

DAIRY FARMING—DAIRYING—AGROTECHNY.

Feeding experiments with milch cows, J. Hansen (*Arb. Deut. Landw. Gesell., 1907, No. 134, pp. 73*).—The first part of this publication is devoted to an account of three series of experiments carried out in 1905-6 and 1906-7, with 51 cows, in 2 dairy establishments, to obtain information regarding the most desirable quantities of total food and of protein for milch cows. It was found that for a satisfactory milk production accompanied by a gain in weight of the cows a total ration with a starch value of 14.4 lbs. per 1,000 lbs. live weight, and supplying 3.1 lbs. of total protein, or 2.5 lbs. of proteid, was necessary. This might perhaps be increased to 3.5 lbs. of protein, but in that case increase in weight of the cows rather than in milk production would be the desired object.

The second part of the publication reports an investigation in which ensiled beet leaves and tops, dried beet leaves and tops, and dried sliced potatoes were compared as food for milch cows. On the average the cows produced slightly less milk and fat on the dried beet fodder than on the ensiled fodder, but the difference was equalized by the more favorable influence of the former upon the live weight. Dried potatoes had a very favorable effect on the quantity of milk, but the percentage of fat in the milk was smaller than with the beet fodder. There was, however, a larger increase in body weight on the dried potato fodder.

A method of adjusting crop acreages to the needs of a herd, W. J. Spillman (*Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 139-143*).—The author states that a single fixed rotation seldom produces feed in needed proportions. "On most farms the size of the herd is usually less than it might be if each of the different kinds of feeds were grown in approximately the proportions needed." Using as factors assumed values for productive capacity of cows, maintenance and productive rations, feeding system, and yields of crops fed, the author has devised a method for computing the acreage to be devoted to each of the crops for a given number of cows with the necessary complement of other stock. The application of the method is described in detail.

Dairy cow records, J. H. Grisdale (*Canada Expt. Farms Rpts. 1906, pp. 49-66*).—Data regarding consumption and production are recorded for 40 cows in 21 months. The returns for 1 year, not including labor, ranged from a profit of $68.79 with 1 cow to a loss of $16.08 with another cow.

Brief popular statements regarding the breeding and feeding of the dairy calf are given, and feeding experiments with various concentrated feeding stuffs, with a proprietary stock food, and with roots *v.* ensilage for dairy cows are reported.

A simple method of keeping creamery records, B. D. WHITE (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 126, pp. 12*).—Successful management of the creamery business depends very largely upon satisfactory records of transactions. Special forms and record books are requisite, but no special system is on the market and there is little uniformity in the method of keeping records in creameries. For the improvement of this condition the present circular has been issued, illustrating a system of blanks which may be used as models in ruling creamery books. Common record books may be used and can be ruled by hand in a short time. The suggested forms are simple and readily understood.

Designs for dairy buildings, E. H. WEBSTER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 287-308, figs. 32; Circ. 131, pp. 26, figs. 32*).—The designs shown in this article "represent feasible and inexpensive dairy buildings planned by the Dairy Division and built in various sections of the country." They "are not intended to represent the only constructions advisable for the purposes indicated, but are intended to be suggestive of certain principles of construction which any architect or builder may use in designing a barn or other dairy building for a special location."

First lessons in dairying, H. E. VAN NORMAN (*New York, 1908, pp. 98, pl. 1, figs. 46*). In this book the writer has attempted to meet the needs of the farm butter maker and handler of milk for the factory or shipping station. He explains briefly the underlying principles of dairying for the student beginner, unfamiliar with the terms and laws of bacteriology and chemistry, and suggests practice adapted to the conditions of the farm as distinct from those of the creamery and cheese factory.

Test of a mechanical cow milker, T. I. MAIRS (*Pennsylvania Sta. Bul. 85, pp. 11, figs. 4*).—Ten cows of the station herd were divided into 2 lots nearly equal as regards age, stage of lactation, and productive capacity as determined by past records. The experiment was divided into 4 periods of 4 weeks each. During the first and third period lot 1 was milked by machine and lot 2 by hand, and during the second and fourth periods lot 2 was milked by machine and lot 1 by hand. From the results of the tests, which are given for the various cows in detail, the following conclusions are drawn:

"It required from two to three times as long to milk a cow with the machine as would be required by a good hand milker, but one operator can handle two or three machines so he could milk four or more cows with the machine in less time than he could milk the same number by hand.

"In general cows were milked cleaner as they became accustomed to the machine, but individuals varied widely in this respect. Two of the cows tested could never be milked with the machine without leaving one or more pounds of strippings, while the others were often milked as completely as would be done by hand under ordinary circumstances.

"No difference in yield of milk was observed that could be attributed to the machine milking, but there was usually a slight drop when changing from one method to the other, always in changing from hand to machine milking.

"No injury to the udder took place that could with certainty be attributed to the use of the machine.

"The general health of all the cows remained good during the entire experiment.

"Wide variations in the flavor and keeping qualities of milk were observed from different cows, but the quality of the milk from each cow remained practically constant whether she was milked by hand or machine."

A method of milk production, C. E. NORTH (*Med. Rec.* [*N. Y.*], *73* (*1908*), *No. 7, pp. 263–266*).—The author found from experience, which he describes, that "the use of sterile covered pails and sterile milk cans by the ordinary farmer will immensely reduce the bacteria in his milk, even though no other sanitary precautions are taken." He suggests that since the farmer has not facilities for proper sterilization of his milk utensils it is desirable to "increase the functions of the creamery, so that it becomes a washing and sterilizing plant for all the milking pails and milk cans of all the farmers contributing milk to it." The creamery should require its patrons to use only those utensils and to deliver the milk twice a day. "The dairy house, where washing and sterilizing of utensils and cooling and bottling of milk are done, may be at a distance of several miles from the cow stable without materially increasing the bacterial count, provided the milk is delivered at the dairy house within one hour after milking."

The hygienic and economical production of milk for infants, PUSCH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3* (*1908*), *No. 5, pp. 401–469, figs. 10*).—This is to a large extent an account of experience at the veterinary high school in Dresden. The health of cows, their care and feeding, and methods of milking and handling the milk are discussed.

Inspection of dairies, C. HARRINGTON (*Ann. Rpt. Bd. Health Mass., 38* (*1906*), *pp. 415–427, pls. 14*).—Of the 3,421 dairies examined by the veterinarian employed by the board for this purpose, 1,064, or 31 per cent, were found to be without objectionable feature. The attention of the proprietors of the remaining 69 per cent of the dairies was called to the objectionable conditions, the great majority of which were stated to be susceptible to correction at little or no expense. The report states that the results, while not all that could be wished, have been very encouraging for hopes of success in the efforts to improve the condition of the milk supply. The nature of the defects to which attention was called is explained and illustrated.

Milk supply of Chicago and twenty-six other cities, J. M. TRUEMAN (*Illinois Sta. Bul. 120, pp. 41–70*).—The principal feature of this bulletin is the report of results of a 7 months' study of the conditions under which milk is sold in Chicago, in which about 1,100 samples were collected and analyzed by the author. In addition to that, the conditions in 26 other cities of 10,000 or more population are discussed.

The data reported show chiefly the percentage of fat and the amount of sediment in the milk, and the results of examination by the Wisconsin curd test. Considerable difference was found in the quality of the milk bought in different sections of Chicago. In the better portions of the city the milk was uniformly up to grade in butter fat, the data reported showing that of 95 samples from one such district only 9 per cent were below standard grade in this respect. On the other hand, in poorer sections of the city the quality of the milk was not so good. In one section, of 413 samples tested 32 per cent were below the legal standard of butter fat, and in another section, of 150 samples collected 50 per cent were below the standard. The larger portion of the milk throughout the city also contained considerable quantities of sediment.

Of the milk collected in the smaller cities over 19 per cent of the samples were found to be below the legal standard of butter fat, and 63 per cent were below the legal standard for total solids.

Market milk, bacteriological data, F. L. STEVENS (*Centbl. Bakt.* [*etc.*], *2. Abt., 20* (*1907*), *No. 4–5, pp. 114–121*).—The data reported were accumulated during a routine examination of 235 samples of the milk of Raleigh, in continuation of work previously reported (E. S. R., 17, p. 1006).

The maximum number of bacteria per cubic centimeter recorded for any sample was 54,000,000, and the minimum 1,200. As a rule the larger dairies produced milk more contaminated with bacteria than the small producers, although there were exceptions in both cases. The author contends that "within reasonable limits the kind of dairy which produces milk is of greater influence upon the bacterial content of the milk than is the age of the samples or the temperature, and conversely that bacterial analysis will reveal the character of the dairy producing the milk in spite of reasonable variation in the age of the sample or the temperature of the air and milk."

The influence of tuberculination on the secretion of milk, C. TIRABOSCHI (*Hyg. Viande et Lait, 2 (1908), No. 2, pp. 49–57*).—Treating the cows with tuberculin caused an average diminution in the milk production of about 15 per cent, but the loss was nearly twice as large for the cows that reacted as for those that did not. This effect continued for only the first 2 days after injection of the tuberculin. During the first 24 hours after treatment the proportion of some of the milk constituents was apparently increased, though this may have been due to a concentration by diminution in the quantity of water in the milk.

The monoamino acids of albumin from cow's milk, E. ABDERHALDEN and H. PŘIBRAM (*Ztschr. Physiol. Chem., 51 (1907), No. 4–5, pp. 409–414*).—Pure albumin of cow's milk yielded alanin, valin, leucin, prolin, aspartic acid, glutaminic acid, phenylalanin, and tyrosin. The results are given quantitatively.

The enzyms of cow's milk, A. J. J. VANDEVELDE (*Rev. Gén. Lait, 6 (1907), Nos. 16, pp. 361–370; 17, pp. 385–397; 18, pp. 414–422*).—This article consists of the discussion of studies of proteolytic enzym or lactoproteolase, lipolytic enzym or lipase (steapsine), and salol enzym, reported in a publication previously noted (E. S. R., 19, p. 777).

Investigations on the proteolysis of cow's milk, A. J. J. VANDEVELDE (*Bul. Soc. Chim. Belg., 21 (1907), No. 12, pp. 434–458*).—This article comprises the principal portion of the discussion of experiments on lactoproteolase in a publication previously noted (E. S. R., 19, p. 777).

The refraction of butter fats and their nonvolatile fatty acids, A. G. BREEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 2, pp. 79, 80*).—Data obtained in the examination of 48 samples of butter are reported.

Condensed milk, A. McGILL (*Lab. Inland Rev. Dept. [Canada] Bul. 144, pp. 25*).—A report of the data obtained in the examination of 47 samples of unsweetened and 95 samples of sweetened condensed milk.

Spread of tuberculosis through factory skim milk, H. L. RUSSELL (*Papers and Rpts. Amer. Pub. Health Assoc., 32 (1906), pt. 1, pp. 139–152*).—This article has been abstracted from another source (E. S. R., 19, p. 79).

[Test of a new form of butter separator], F. T. SHUTT (*Canada Expt. Farms Rpts. 1906, pp. 176–180*).—Tests of an apparatus, which is claimed to be "a new invention which will produce a maximum quantity of pure butter from sweet or sour milk and cream in five to ten minutes," are reported. The results obtained are very unfavorable to the device as a substitute for the ordinary churn.

Goat's milk and butter, K. FISCHER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 1, pp. 1–13*).—In these investigations 61 goats of different ages were used, and in most cases 3 samples of milk from each goat, obtained at intervals of 3 to 4 weeks, were analyzed. The data of the individual tests are reported.

In the average of all the tests the specific gravity was 1.0298, the fat content 3.47 per cent, and the dry matter 11.88 per cent as computed by Fleischmann's formula, and 11.69 per cent as determined. In several samples the proportions of protein, fat, sugar, and ash were determined. Subsequent tests of 14 goats in winter with dry feeding and advance of lactation period showed a notable increase in dry substance, and especially fat, the average being specific gravity 1.0321, fat 4.27 per cent, dry matter 13.42 per cent. The butter made from the milk of these goats had no disagreeable odor or taste. In the average of 15 tests the refractive index at 40° was 40.00, the Reichert-Meissl number 22.66, the Polenske number 7.95, the saponification number 237.19, and the iodin number 25.15.

Regarding sheep's butter and goat's butter, R. K. Dons (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 2, pp. 72 74*).—A study of analytical constants is reported.

Cheese made from sheep's milk, O. Laxa (*Rev. Gén. Lait, 6 (1907), Nos. 19, pp. 433 444; 20, pp. 457-464; 21, pp. 481–489; 22, pp. 505–511, pls. 4*). Cheese made from sheep's milk is a dietary article of considerable importance among the Slavs. This article describes the methods of preparation of three sorts of such cheese, Brynza, Oštiepek, and Parenica, together with chemical and bacteriological studies of these products. An interesting detail is the use of nettles in the preparation of the milk for cheese making, resulting, according to the studies of the author, in the transformation of the casein into soluble albuminoids under the action of a proteolytic diastase in the nettles.

Chemical study of the ripening of soft cheese, R. Sanfelici (*Staz. Sper. Agr. Ital., 41 (1908), No. 1, pp. 5–34*).—The theories of different investigators regarding the ripening of cheese are reviewed and an analytical study of Quartirolo and Crescenza cheese is reported.

The results of the experiments show that "in Crescenza cheese ripened at low temperature (5 to 10° C.) the solubility of the casein is greater than in Quartirolo cheese ripened at higher temperature (15 to 20° C.). In these two types of soft cheese the solubility of the casein and therefore the ripening depends upon unorganized ferments or enzyms, and very probably on galactase of milk and pepsin or rennet. In the Crescenza cheese the production of peptones is more extensive than in Quartirolo cheese. In either type of soft cheese the fat was not appreciably altered and therefore did not participate in the ripening.

The micro-organisms of kefir, E. I. Nikolaiewa (*Izv. Imp. St. Peterb. Bot. Sada [Bul. Jardin Imp. Bot. St. Petersb.], 7 (1907), No. 4, pp. 141, 142*).—In kefir and kefir grains the investigator regularly found three forms of micro-organisms, and occasionally several other forms, all of which are described. The organisms *Bacterium caucasicum* and *Torula kefir* are stated to be especially necessary for the production of kefir.

Conditions governing yield in "quick-process" vinegar production, W. Hoffmann (*Pure Products, 4 (1908), No. 2, pp. 74-77*). "To reduce losses as much as possible, the generators should be made with perforated bottoms, for by means of these perforated bottoms, evaporation is counteracted through the condensation of the alcohol and of the vinegar vapor. Moreover, in the operation, . . . it is above all necessary to see that periodical infusions of mash and return-vinegar are employed. Further, the automatic return pumping apparatus must be so manipulated that the vinegar which has been run off only a short time before, is returned to the apparatus while still warm from the generator. . . . The automatic discharging apparatus for the vinegar returns must always be so operated that the vinegar is still warm and consequently rich in enzymatic activity, and, in large quantities, as in the hand process, viz., of about 10 liters for each sparging over."

Sulphurous acid in wine making, E. Dupont and J. Ventre (*Ann. Ecole Nat. Agr. Montpellier, n. ser., 7 (1907), No. 2, pp. 136–160; 7 (1908), No. 3, pp.*

161–229).—In this article the author reviews the present status of the use of sulphurous acid in wine making, particularly in the manufacture of red wine, introducing into his discussion facts obtained in laboratory investigations and in commercial experience. The first part of the discussion is devoted to a consideration of the antiseptic action of sulphurous acid on the vitality of the yeast, and the second part to its action upon the alcoholic fermentation and the quality of the wine. Attention is also given to forms in which the acid may be used, the economy of the process of sulphiting, and some of the causes of failure. An appendix reports results of experiments relative to the action of sulphurous acid on the color of wine.

Handbook of potato drying, E. Parow (*Handbuch der Kartoffeltrocknerei. Berlin, 1907, pp. VIII+210, pls. 9, figs. 9*).—The potato harvest in Germany for years has been increasing more rapidly than the consumption in usual ways as food, for production of starch, brandy, etc. A considerable portion of the excess yield is now dried, the dried product being used as a feeding stuff and in various technical industries.

This volume presents and discusses a large amount of information on the industry of potato drying. A large section is devoted to descriptions of processes and apparatus employed, and another to consideration of the results of investigations by numerous authors on the value of the dried potatoes for food, feeding stuff, raw material in technical industries, etc.

The manufacture of sugar from sugar cane in Java, H. C. P. Geerligs (*Handboek ten dienste van de Suikerriet-Cultuur en de Rietsuiker-Fabricage op Java. Amsterdam, 1907, pt. 3, pp. XXIV+449+XX*).—This volume comprises part 3 of a handbook for use in the culture of sugar cane and the manufacture of cane sugar. Part 1 includes chemical methods of investigation of the Java cane sugar industry, and part 2 a discussion of the enemies of sugar cane (E. S. R., 19, p. 552). In the present publication the author presents a summary and discussion of chemical knowledge regarding sugar, its raw material, and its manufacture.

Evaporator scale, S. S. Peck (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 21, pp. 37*).—An attempt has been made to ascertain whether data obtained in research by various investigators on the solubility of phosphates of lime, alumina, and iron, and of sulphate of calcium, in water and salt solutions under various conditions could be put to practical application in lessening the amount of scale formed in or on the tubes of the effects in the mills of Hawaii. The results obtained, as reported in this bulletin, offer no precise solution to the problem, but they explain some of the phenomena of scale formation.

Chinese albumin manufacture, W. Martin (*Daily Consular and Trade Rpts.* [*U. S.*], *1907, No. 2960, pp. 11, 12*).—The manufacture of evaporated egg white and yolk in China is described.

The utilization of wood waste by distillation, W. B. Harper (*St. Louis, 1907, pp. 156, figs. 74*).—A general consideration of the industry of wood distilling, including a description of the apparatus used and the principles involved, as well as the methods of chemical control and disposal of the products. The subject is treated in a popular manner and from a commercial point of view.

VETERINARY MEDICINE.

Manual of pathological histology, V. Cornil and L. Ranvier (*Manuel d'Histologie Pathologique. Paris, 3. ed., vols. 1, 1901, pp. IV+999, figs. 369; 2, 1902, pp. 864, figs. 202; 3, 1907, pp. 1171, figs. 388*).—This comprehensive manual of pathological histology is written from the standpoint of human medicine but naturally deals with many general conditions which are common to man and animals and with diseases which are likewise intertransmissible between man and animals.

Volume 1 deals with general pathological anatomy, alteration of cells, inflammations, tumors, pathogenic bacteria, and diseases of bones. The subject matter of volume 2 includes the pathological anatomy of muscles, blood, bone marrow, and general neurology. Volume 3 treats of the pathological histology of various parts of the nervous system and the vascular, lymphatic, and respiratory systems.

A practicum of bacteriology and protozoology, K. KISKALT and M. HARTMANN (*Praktikum der Bakteriologie und Protozoologie. Jena, 1907, pp. VI+174, figs. 89*).—An attempt is made in the present volume to give briefly such details of technique as are necessary in the study and identification of the most important pathogenic bacteria and protozoa. In preparing this material the author had in mind the needs of the practicing physician and veterinarian.

Instructions for preparing and shipping pathological specimens for diagnosis, G. H. HART (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 197–206; Circ. 123, pp. 10*).—The modern improvement of technique in the study of the tissues and micro-organisms in diagnosing disease renders it desirable that more care should be exercised in obtaining and shipping samples from the field to laboratories where they may be studied. Detailed directions are given regarding the points to be considered in this work.

In general, the spleen and heart should be forwarded to the laboratory for bacteriological examination. These and other organs should be removed as soon as possible after death, washed in a solution of bichlorid of mercury or some other antiseptic, wrapped in antiseptic gauze and paraffin paper and carefully boxed before shipment. If preferred, the organs may be sprinkled with powdered boric acid and wrapped in dry gauze. In hot weather or where it is desirable to send only a small portion of an organ, some killing fluid should be used for preserving it before post-mortem changes take place. For this purpose Orth's fluid is recommended. Special directions are given for shipping material in cases of rabies, anthrax, tuberculosis, and glanders, and in shipping samples of milk, affected parts of skin, and material for museum specimens.

Some of the unsolved problems of immunity, A. G. NICHOLLS (*Proc. and Trans. Roy. Soc. Canada, 2. ser., 12 (1906), Sec. IV, pp. 257–266*).—The exact basis of natural immunity of individuals and races is not well understood. It is possible that with a fairly complete explanation of its occurrence a better basis may be given for future work in the production of artificial immunity by different methods.

Animal breeding and disease, A. D. MELVIN and E. C. SCHROEDER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 213–222*).—This article has already been noted from another source (E. S. R., 18, p. 696).

Contagious diseases of animals in foreign countries (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 327–334*).—Brief statistics are given on the occurrence of the more important contagious diseases in Austria, Belgium, Cape Colony, Denmark, France, Germany, Great Britain, and other European countries.

Report civil veterinary department, eastern Bengal and Assam, W. HARRIS (*Rpt. Civ. Vet. Dept., East. Bengal and Assam, 1907, pp. 11*).—The civil veterinary department of eastern Bengal and Assam has been in existence for only 1 year. Considerable attention has been given to veterinary instruction and to practical work in the control of glanders, surra, rinderpest, anthrax, hemorrhagic septicemia, foot-and-mouth disease, and blackleg. During the year under report more than 18,000 animals were inoculated for the prevention of rinderpest and of this number only 169 died. Some attention is also being given to the improvement of native cattle.

Report of the Department committee on the Federal meat-inspection service at Chicago, J. R. Mohler, R. P. Steddom, and G. P. McCabe (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 406–456*).—A detailed description is given of the Federal ante-mortem meat-inspection service, post-mortem inspection of meat, State and municipal inspection of meat in Chicago, Government supervision of canned products, the sanitary condition of various abattoirs and packing houses, and the legal phases of the question, including the scope of authority now possessed by the Federal, State, and municipal authorities.

The cure of experimental nagana, F. Loeffler and K. Rühs (*Deut. Med. Wchnschr., 33 (1907), No. 34, pp. 1361–1366*).—Several experiments have shown the value of atoxyl, trypanrot, and other substances in the control of trypanosomiases. In experiments with guinea pigs, rats, and rabbits it was found possible to protect these animals against repeated infection and to cure serious cases of the disease by the use of atoxyl. In the authors' experiments, arsenious acid is used and this substance is considered a specific against trypanosomes. Its curative effect is manifested promptly whether it is administered by way of the mouth, in the blood circulation, or in the peritoneal cavity. Beneficial results, however, are obtained only when the drug is given in a systematic manner, in the proper doses, and at the proper intervals.

According to the authors, it appears that the fatal dose is about one-third larger than the curative dose. It is recommended that the remedy be administered at 5-day intervals.

Anthrax in Arkansas, R. R. Dinwiddie (*Arkansas Sta. Bul. 96, pp. 91–112*).—A general account of the nature of anthrax is given by the author. During 1905–6 a serious outbreak of this disease occurred in certain parts of Arkansas. Horses and mules were more frequently attacked than other animals. The disease appeared to depend for its distribution upon swampy, overflowed lands and the agency of insects and infected fodder. Anthrax may be controlled by the destruction and cremation of affected animals, burning of infected pastures, and plowing and cultivating infected fields. Vaccination is recommended as being of some value, although it is contended that much of the commercial vaccine available for use against anthrax is too weak or at least ineffective.

Anthrax and anthrax vaccines, R. R. Dinwiddie (*Arkansas Sta. Bul. 97, pp. 113–132*).—The commercial vaccines available in this country were tested by the author for the purpose of determining their effectiveness or the causes of failure in using them. It was found that anthrax blood becomes sterile if dried on paper for 4 or 5 days. Anthrax bacilli in horseflies and cattle ticks do not form spores, but soon lose their vitality. According to tests made on laboratory animals anthrax blood sterilized by desiccation has no protective value as a vaccine and in general no immunity appears to be conferred by vaccination with sterilized cultures. It was found that the commercial anthrax vaccines obtainable in this country contain attenuated anthrax bacilli, but that they are inefficient either on account of age or of overattenuation.

Some observations on rabies, E. C. Schroeder (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 181–196; Circ. 120, pp. 16*).—The discussion of the subject of rabies provokes considerable antagonism from certain dog fanciers who are disposed to doubt the existence of the disease, but, according to the author, the evidence proving the distinct and specific nature of rabies and the high mortality which it causes is sufficient to convince the unprejudiced observer, and there appears to be no foundation for the somewhat prevalent idea that rabies may be a disease of the imagination. Statistics are presented regarding the frequency of the occurrence of rabies, and detailed clinical notes are given on two cases of the disease which occurred in horses at the experiment station of the Bureau of Animal Industry.

The chief reason why dogs are most often concerned in the transmission of rabies is that these animals are of a social nature and frequently get into fights in which a rabid dog has opportunity for transmitting rabies to other dogs.

It is impossible to control rabies by Federal legislation, but this matter should receive more earnest attention from State legislatures and municipalities. Laws for the control of rabies should require licensing of dogs and muzzling of dogs on public highways and should hold dog owners responsible for all damage caused by their dogs.

Rabies and its increasing prevalence, G. H. Hart (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 129, pp. 26, fig. 1*).—An account is given of the history and prevalence of rabies in the District of Columbia and in various States throughout the country. Attention is called to the importance of the disease and to a number of popular fallacies concerning it. The author describes the symptoms of rabies and gives notes on the period of incubation, the disposal of rabid dogs, post-mortem examination of rabid dogs, methods of preparing the tissues to be forwarded to the laboratory, diagnosis of rabies by laboratory methods, the Pasteur and Högyes methods of preventing the disease, and general recommendations for the eradication of rabies in the United States. It is urged that rabies could be entirely eradicated if all dogs were muzzled for a few years.

Normal brain substance and rabies vaccine, C. Fermi (*Centbl. Bakt. [etc.], 1. Abt. Orig., 44 (1907), No. 5, pp. 475–478*).—When used in a fresh condition normal nerve substance exercised as great an immunizing power against rabies as did rabies virus obtained from the brain substance of diseased animals. During desiccation, however, the normal nerve substance became attenuated more rapidly than did rabies virus.

Comparative histological and bacteriological investigations on the relationship of human and bovine tuberculosis, A. Eastwood (*Roy. Com. Tuberculosis, Second Interim Rpt., 4 (1907), pt. 2, App., pp. XXXII+292, charts 8*).—A detailed report is given on the histological and bacteriological results obtained in a comparison of the virulence and pathology of human and bovine tubercle bacilli in cattle, rabbits, anthropoid apes, monkeys, goats, swine, dogs, cats, and rats.

In all of these animals the pathological processes produced experimentally by inoculation with bovine and human tubercle bacilli are essentially alike. Bovine tubercle bacilli in adequate doses produce an acute type of tuberculosis in cattle. Human tubercle bacilli tested under similar conditions produce lesions identical with those of bovine tubercle bacilli in some cases, while other cultures of human bacilli produce only a mild type of the disease. It appears, therefore, that some viruses of human origin are relatively innocuous to cattle.

Bovine tubercle bacilli even in small doses produce a typical pathology of tuberculosis in anthropoid apes and man. Human bacilli of low virulence for cattle produce typical lesions in anthropoid apes, but the form of the disease is not more severe than from similar infection with bovine tubercle bacilli. In fact human tubercle bacilli produce no pathological processes which are more severe or in any way essentially different from those caused by bovine bacilli.

The author states that in his investigations not the slightest indication has been obtained of any peculiarity of bovine virus which might suggest its being relatively innocuous to the human body. With regard to the cultures of bacilli obtained from a great variety of sources, the bovine and human tubercle bacilli on artificial nutrient media possess in common the characteristics of mammalian tubercle bacilli. Slight differences which sometimes appear are not constant or stable. The cultures of bovine and human tubercle bacilli kept under identical conditions grow in the same way. "There is, therefore, an essential unity not only in the nature of the morbid processes induced by human and bovine tubercle bacilli but also in the bacteriological characters of the tubercle bacilli which causes these processes."

Veterinary aspect of the tuberculosis problem, J. Pemberthy (*Jour. Roy. Inst. Pub. Health, 15 (1907), No. 10, pp. 577-597*).—A statement is given of the opinions which are at present held regarding the extent to which tuberculosis in man is due to the same disease in cattle. The author believes that it may be very important to discover under what conditions the transmission of tuberculosis from animals to man takes place. There are many other problems at present but partly understood regarding the transmission of the disease. No amount of uncertainty or lack of information on these points, however, can in any way affect the desirability of preventing in so far as possible the use of milk which may contain tubercle bacilli.

The relative importance of the respiratory and digestive tracts in tuberculous infection, R. Pfeiffer and E. Friedberger (*Deut. Med. Wchnschr., 33 (1907), No. 39, pp. 1577-1581*).—The authors sought by means of experiments on guinea pigs to determine whether infection with tuberculosis takes place more easily through respiratory organs or the alimentary tract. The results of these experiments indicate that in the case of guinea pigs the inhalation of the minutest quantities of tubercle bacilli is a much more certain means of bringing about infection with tuberculosis than feeding tubercle bacilli. It was necessary to use several thousand times as much to produce infection in the alimentary tract as when infection was brought about in the lungs.

The susceptibility of tubercle bacilli to modification, J. R. Mohler and H. J. Washburn (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 113-163, pls. 4*).—The literature relating to the modifications which tubercle bacilli may undergo is critically reviewed in connection with a bibliography. Upon the basis of experimental work the authors come to the conclusion that in some instances tubercle bacilli may be modified not only in form but in pathogenicity and in cultural characteristics. Virulent cultures may be attenuated by continued artificial cultivation. The virulence of cultures may also be increased by repeated passage through dogs or other experimental animals. In this way avian tubercle bacilli were brought to a high degree of virulence.

The cultural characteristics of tubercle bacilli change with the pathogenicity of any particular culture. As the bacilli becomes attenuated they grow more abundantly upon artificial nutrient media. When grown artificially tubercle bacilli may be promptly altered with almost every change of the nutrient medium to which they are transferred. The morphology of the bacilli is, therefore, so unstable that little dependence can be placed on the mere finding of certain forms of tubercle bacilli in a given case of tuberculosis.

Tubercle bacilli in butter: Their occurrence, vitality, and significance, E. C. Schroeder and W. E. Cotton (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 127, pp. 23*).—In milk, tubercle bacilli are carried upward with the cream and downward with the sediment. They, therefore, occur in greater proportion in the cream and ultimately in the butter than in the whole milk from which the butter was made. Tubercle bacilli may remain virulent in salted butter for a long time, even after 99 days showing only a slight reduction of their virulence. There is nothing in butter except salt to act as an antiseptic and its action in this regard is very slight. Attention is called to the fact that bovine tubercle bacilli are in all probability more virulent for man than are human bacilli.

Dissemination of tuberculosis by the manure of infected cattle, M. H. REYNOLDS and W. L. BEEBE (*Minnesota Sta. Bul. 103, pp. 39–62, pl. 1, figs. 7*).—The experiments reported in this bulletin were undertaken for the purpose of determining the mode of exit of tubercle bacilli from tuberculous cattle and whether any clinical symptoms can be noted in cases in which the feces contain tubercle bacilli. The results obtained were of a somewhat negative character. The feces of 45 tuberculous cows were carefully examined for the presence of tubercle bacilli and inoculations were made to determine the virulence of these bacilli. In only one case was any evidence obtained of tubercle bacilli in the feces. Among these 45 animals, 16 were thus tested three times, 1 five times, and 2 four times.

Similarly the nasal secretion was tested for virulence in 14 of the cattle and only one showed the presence of a virulent nasal secretion. This cow was the same one which was passing tubercle bacilli with the feces. It is suggested that further studies along this line are required in order to determine the relative frequency with which tubercle bacilli appear in the feces of tuberculous cattle.

Tuberculosis of domestic stock and its control, H. L. RUSSELL (*Wisconsin Sta. Special Bul., pp. 6, figs. 2*).—The author presents a discussion of the economic importance of tuberculosis, the symptoms, etiology, and mode of infection of the disease and the means of recognizing it. Particular attention is called to the necessity of the general use of the tuberculin test and the sterilization of all creamy by-products. At present the State law prohibits the importation of dairy and breeding cattle until they have been tested with tuberculin. It is recommended that the same law should apply to the transference of cattle from one owner to another within the State.

An experimental study of ophthalmo-reaction to tuberculin, A. CALMETTE, M. BRETON, and G. PETIT (*Compt. Rend. Soc. Biol.* [*Paris*], *63* (*1907*), *No. 28, pp. 296–298*).—When healthy rabbits were inoculated intravenously with tuberculin it was found that after a period of 16 hours they would react in a typical manner to tuberculin placed in the eye. Similarly when rabbits were fed tuberculin the material seemed to be so distributed by means of the alimentary tract as to render the animals sensitive to the ophthalmo reaction. This false reaction appears to indicate that even in healthy animals if tuberculin is brought in contact with the tissue it remains sensitive to tuberculin for a number of days.

Cuti-reaction to tuberculin, J. LEMAIRE (*Compt. Rend. Soc. Biol.* [*Paris*], *63* (*1907*), *No. 28, pp. 299, 300*).—If after obtaining a positive reaction in the skin or eye a subcutaneous injection of tuberculin is given, it is followed by a reappearance of the tuberculin reaction in the skin or eye. If a second cutaneous or ocular test of tuberculin be made, the reaction appears much more promptly than upon the first test.

Actinomycosis and botryomycosis, G. H. WOOLDRIDGE (*Jour. Compar. Path. and Ther., 20* (*1907*), *No. 3, pp. 189–202*).—The symptoms, etiology, and pathological lesions of this disease are described with particular reference to the relationship between human and bovine actinomycosis and the attitude of the meat inspectors toward the disease. The cultural characteristics of the organism of botryomycosis are briefly outlined. This disease may best be treated by surgical removal of the lesions. Internal use of iodid of potash has given very poor results in the author's experience.

Blackleg and vaccination for it, N. S. MAYO and W. W. DIMOCK (*Estac. Cent. Agron, Cuba Circ. 27, pp. 15, figs. 2*).—The occurrence and pathology of this disease are discussed and directions are given for the vaccination of young cattle as a means of prevention.

Pica of cattle, R. Ostertag (*Landw. Wchnbl. Schles. Holst., 57 (1907), No. 43, pp. 712–717*).—Pica appears sometimes to an alarming extent among cattle maintained in the region of moor meadows. The familiar symptoms of this disease are described in detail. In the region of Johannesburg the hay of moor meadows may cause the disease, and this may be especially true after some artificial improvement has been made upon the quality of the meadows. The injurious effects of the hay vary from year to year.

The disease appears to be in the nature of a disturbance of metabolism, and manifests itself chiefly in the morbid tendency to gnaw and lick various objects. The nature of the poisonous substance in the hay of moor meadows is not well understood. The author states that the disease can be largely prevented by grazing these meadows, by using a partly fermented hay in the place of hay cured in the ordinary manner, and by sowing clover in the meadows.

Texas fever and cattle ticks, N. S. Mayo (*Estac. Cent. Agron. Cuba Bul. 6, pp. 50, pls. 7, figs. 9*).—Cattle owners are urged to exterminate ticks as far as possible for the reason that they transmit Texas fever and irritate infested cattle to such an extent by their presence and by the removal of blood that great loss of condition and even death may result. Various oil and arsenical preparations have been found useful in destroying ticks. These dips are briefly described. An account is also given of the life history of the tick.

The first season's work for the eradication of the cattle tick, R. P. Steddom (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 101–112*).—The essential features of this article have appeared elsewhere and have already been noted (E. S. R., 19, p. 80).

The prevention of parasitic infection in lambs, B. H. Ransom (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 207–212*).—The experiments of which the results are reported in this paper were carried on at the experiment station of the Bureau of Animal Industry of this Department. The tests began in 1905 and had for their main purpose the determination of the conditions under which lambs become infested with round worm parasites.

As a result of the author's experiments it is concluded that lambs from infested ewes will remain free from hook worms if separated from the ewes soon after birth and afterwards allowed with them only during short periods in clean pens. The bare-lot method recommended by W. H. Dalrymple does not protect lambs from infestation with twisted stomach worms, but in some cases infestation with hook worms may not occur when the bare-lot method is adopted. Lambs kept by the bare-lot system may escape infestation with nodular worms.

Sheep infested with stomach worms, hook worms, and nodular worms were found to be still infested after the lapse of 19 months, during which time they were kept on a clean board floor. Infested pastures became free from hook worms and nodular worms, but not from twisted stomach worms when sheep were kept out of them from October 25 to June 26 in the latitude of Washington.

Epizootic cerebro-spinal meningitis of horses, R. W. Hickman (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 165–172; Circ. 122, pp. 8*).—The symptoms and distribution of this disease are described and particular attention is given to a discussion of two outbreaks of the disease which occurred in North Carolina, in which the trouble spread rapidly and caused a high mortality among infected animals.

The disease spreads more rapidly and widely in low-lying localities in which the drainage is defective. The inauguration of a hygienic system of feeding and watering animals and draining the farm is necessary in its further prevention. One attack does not protect the animal against subsequent attacks.

In treating animals for cerebro-spinal meningitis the patients should first be removed to dry, well-ventilated buildings and a complete change should be made in the ration. In some cases it may be necessary to buy forage and grain from a distant locality in order to avoid infection. Isolation and quarantine should be observed as strictly as in the case of other infectious diseases. In many cases the paralysis of the throat is so pronounced that the animal is unable to swallow, in which case eserin may be injected hypodermically. Where paralysis does not occur purgatives may be administered combined with belladonna, and if necessary ammonia may be applied to the nostrils to stimulate the animal sufficiently to admit of the administration of the purgative.

Osteoporosis or bighead of the horse, J. R. Mohler (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 173–179, pls. 2; Cir. 121, pp. 8, figs. 5*).—Osteoporosis must be considered as distinct from osteomalacia for the reason that it does not yield to the same treatment and sometimes occurs on limestone soils. The cause of the disease is still unknown, although many suggestions have been made concerning it. It has many of the characteristics of an infectious disease and appears to be due to a nitrifying organism which prevents assimilation of mineral salts.

The early symptoms are sometimes overlooked. Affected horses and mules may show hock lameness or symptoms of rheumatism. Usually the first symptom is loss of vitality and irregular appetite followed by shifting lameness. Later the bones of the head including the jaw and nose begin to swell. The chief lesions are in the bone and show conclusively that the nutrition of the bone is disturbed. The marrow and cancellated tissue of the long bones may contain blood and soft gelatinous material or fibrin.

Prognosis is uncertain but somewhat favorable if an entire change of feed, water, and location is made. It is recommended that lime and phosphorus be administered in an assimilable form and that the rations should contain beans, cowpeas, oats, cotton-seed meal, or other materials rich in mineral salts.

White diarrhea of chicks, with notes on coccidiosis in birds, G. B. Morse (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 128, pp. 7*).—The general prevalence of white diarrhea among chicks led to an investigation resulting in the discovery that large numbers of *Coccidium tenellum* are always found upon the intestinal walls of affected chicks, particularly in the ceca. The disease may be described as an inflammation of the ceca caused by *C. tenellum*. It most frequently affects chicks between 2 and 5 weeks of age. Symptoms are dullness, accompanied by white fecal discharge in which circular or oval cysts, the permanent cysts of *C. tenellum*, may be detected under a microscope. The organism in question is frequently found in the intestines of chicks of all ages.

The treatment of the disease is almost useless, but some benefits may be derived from purgatives such as castor oil or calomel and the administration of sulphate of iron in drinking water at the rate of 5 to 10 grains per gallon. This form of coccidiosis may best be controlled by prevention, including antiseptic care of eggs, incubators, and all objects with which the eggs and chicks may come in contact.

Intestinal coccidiosis also occurs in adult chickens, and *C. tenellum* has been found in all cases of limber neck, leg weakness, and going light. Similarly, with so-called leg weakness and weak germs of ducks, the same organism was found.

In studying cases of so-called blackhead in turkeys, *C. tenellum* was constantly found in the diseased ceca, and must be considered as an important, if not the exclusive, cause of blackhead. Intestinal coccidiosis has also been observed in peafowl, pigeons, ducks, swans, pheasants, quail, finches, and canaries.

Parasitic liver disease in poultry, F. V. THEOBALD (*Nat. Poultry Conf. Reading, Off. Rpt., 2 (1907), pp. 181–185*).—This disease occurs in the United States in turkeys and is commonly known by the name of blackhead. In all except 2 cases observed by the author it appeared in chickens. The symptoms of the disease are carefully described. The life history of *Amœba meleagridis*, which is the blood parasite in this disease, has not been definitely determined. No satisfactory treatment has been devised and rational prevention must depend largely on sanitary measures.

Reliable poultry remedies, P. T. WOODS (*Quincy, Ill., 1906, pp. 93, fig. 1*).—Brief descriptions are given of the important diseases of poultry and practical remedies are suggested for their control.

RURAL ENGINEERING.

Irrigation by pumping, F. E. KANTHACK (*Agr. Jour. Cape Good Hope, 32 (1908), No. 1, pp. 50–66, figs. 4*).—It is stated that as a result of inquiry into the matter it has been found that while a fair number of pumping plants for irrigation have been established in different parts of Cape of Good Hope, "they have not been universally successful, and many have been actually abandoned and dismantled." It is believed that in many cases failure has been due to an "unsuitable plant, put down without due consideration or appreciation of the principles governing the problems involved, and it is to endeavor to assist the farmer who is faced by such a problem, and to guide him as to how to set about this development, from inception to completion, that this pamphlet has been written."

The author is of the opinion that while pumping can never hope to compete with irrigation by gravitation, where the conditions are favorable to the latter, there are nevertheless many cases "where the land is of such a fertile nature that even the cost of pumping may, if the scheme is economically designed and efficiently carried out, very well repay the enterprise."

The article deals with the question of estimating the amount of water and size of plant required, the most suitable and efficient engines and pumps to employ, the cost of operation under given conditions of fuel, etc., and the care and operation of the pumping plant, and tables are given showing cubic feet and gallons per acre for different depths of water and the cost of pumping per acre.

Tests of air-gas generators, WEDDING (*Arb. Deut. Landw. Gesell., 1908, No. 135, pp. 49–74, figs. 17*).—Six different kinds of generators for preparing a combustible gas by the mixture of air with the vapor from a volatile hydrocarbon, are described and illustrated. The results of tests of these generators are also given, showing the amount and quality of gas produced from the liquid fuels used. These generators are intended for use in small isolated plants, such as on farms, for furnishing comparatively small amounts of gas suitable for convenient use in furnishing heat, light, or power.

Tests of small motors, SCHIFFMAN and VORMFELDE (*Arb. Deut. Landw. Gesell., 1908, No. 135, pp. 1–45, figs. 19*).—This is the official report of the results of tests of small internal combustion engines especially adapted to use on farms and not exceeding 3 horsepower in size.

The trials were made during May, 1907, in competition for prizes aggregating about $300, offered in connection with the Düsseldorf Exposition. During five days of continuous running, the engines were tested on the following points: Safety of operation; attendance required; consumption of fuel and lubricants; consumption of water; adequacy of regulation under a variable load; steadiness of running; time required to start; fouling of the engine, and the opportunity for quick and convenient cleaning; and ease of moving the engine. Nine engines were used. The construction of the engines is described and illustrated, and a table gives their principal dimensions. The results of the tests are given in a series of tables, the contents of which are fully discussed.

The following table shows the fuel consumption and respective thermal efficiencies of the full load tests:

Comparative test of small motors.

Name of motor.	Kind of fuel.	Low heat value of fuel.	Metric brake horse-power.	Fuel consumption per metric horse-power-hour.	Heat consumption per metric horse-power-hour.	Thermal efficiency.
		Calories.		*Grams.*	*Calories.*	*Per cent.*
Fasnir	Benzene	10,500	4.0	301	3,160	20.0
			3.2	314	3,300	19.2
Daimler	Alcohol	5,500	2.83	632	3,470	18.2
			2.83	544	3,000	21.1
Deutz	do	5,830	3.7	413	2,410	26.2
			3.66	364	2,120	29.8
			3.0	434	2,530	25.0
Do	Benzol	9,600	3.61	264	2,530	25.0
Hille	Benzene	10,500	2.98	338	3,550	17.8
			2.93	365	3,830	16.5
Do	Benzol	9,600	2.98	329	3,160	20.0
			2.95	350	3,360	18.8
Reform	Benzene	10,500	2.8	417	4,380	14.4
			2.84	396	4,150	16.0
Do	Benzol	9,600	2.76	415	3,980	15.9
Richter	Alcohol	5,350	.78	962	5,140	12.3
Scharrer & Gross	do	5,350	2.98	576	3,080	20.5
Do	Alcohol-Ergin	7,550	2.98	450	3,400	18.5

Farm machinery and farm motors, J. B. DAVIDSON and L. W. CHASE (*New York and London, 1908, pp. VII+513, pl. 1, figs. 376*).—This is intended as a text-book on the subject. It is divided into two parts, (1) farm machinery, and (2) farm motors. The first part contains chapters on definitions and mechanical principles, transmission of power, materials, and the strength of materials, tillage machinery, seeding machinery, harvesting machinery, haying machinery, manure spreaders, threshing machinery, corn machinery, feed mills, wagons, buggies, and sleds, pumping machinery, and the value and care of farm machinery. Part 2 contains chapters on animal motors, windmills, steam boilers, steam engines, gas, oil, and alcohol engines, traction engines, electrical machinery, and the farm shop.

College farm buildings, R. S. SHAW and J. A. JEFFERY (*Michigan Sta. Bul. 250, pp. 37–108, figs. 50*).—A description of the farm buildings and fixtures at the Michigan Agricultural College offered "with the thought that it may present or suggest ideas of practical value and at the same time serve as a safeguard against some known errors." The topics discussed include the location and grouping of farm buildings, yards, etc., and details as to the construction of the new horse barn, the silos, the cattle and sheep barns and fixtures, and the piggery and other equipment for swine raising. Plans and photographs accompany many of the descriptions.

RURAL ECONOMICS.

The indebtedness of the peasant class on the continent (*Jour. Bd. Agr.* [*London*], *14* (*1907*), *No. 9, pp. 559-563*).—This is a review of two papers read at the International Congress of Agriculture at Vienna in the spring of 1907, the purpose being to suggest remedies for the preservation of the peasantry and for the burden of indebtedness.

Dr. A. Grimm recommended (1) the extension and improvement of agricultural education, (2) old age pension and better facilities for agricultural laborers to acquire homes, (3) road improvement, and (4) tariff protection for agricultural products and protection of live stock against the introduction of disease.

In the paper by Dr. C. von Grabmayr attention is called to the increasing indebtedness of the peasant class which seriously threatens their future welfare. As remedies he suggests (1) a plan of redemption by instalments by which the debtor instead of paying 5 per cent annual interest as called for by mortgages will pay 4 per cent interest and 1 per cent redemption money, and (2) a legal restriction on the freedom to incur debt. Such remedies it is thought would be effective in forcing the peasant to transform present mortgage indebtedness which the creditor may call in at pleasure into debts which the debtor must pay off by regular instalments. The means advocated for accomplishing this end is the establishment of mutual loan societies of known solidity.

The income of farm laborers, H. Thiel (*Deut. Landw. Presse, 34* (*1907*), *No. 102, p. 795*).—From statistics gathered from two large farms, the author shows that the total income, which includes wages, dwelling, garden, and other privileges, of farm laborers of different capabilities and duties, ranges from 865.60 to 948.09 marks (from about $200 to $225) per annum. The income of farm hands is believed to compare favorably with the wages of the average industrial worker in cities.

Conflicts between proprietors and farm laborers, U. Paluani (*Bol. Quind. Soc. Agr. Ital., 13* (*1908*), *No. 2, pp. 35-39*).—The author describes the organization and functions of arbitration councils composed of proprietors and farm laborers as instituted in France for the settlement of differences, and makes a plea for the establishment of such councils in Italy.

Equipment of small holdings, W. J. Malden (*Jour. Dept. Agr. West. Aust., 15* (*1907*), *No. 11, pp. 852-854*).—The amount and kind of labor and machinery for profitable production on small holdings are discussed in relation to different branches of the agricultural industry.

The new agrarian legislation in Ireland, C. Paladini (*Bol. Uffic. Min. Agr., Indus. e Com.* [*Rome*], *6* (*1907*), *VI, No. 7-8, pp. 853-865, figs. 5*).—A brief historical review of the Irish agrarian question, with more particular reference to the various laws passed by the British Parliament to improve the land-tenure system in Ireland. The expenditures by the Government under these laws from 1869 to June 30, 1906, were £38,404,925 (about $192,000,000).

The measures adopted by the government [of Portugal] to encourage the production, sale, and exportation of agricultural products (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *7* (*1908*), *No. 1, pp. 59-75*).—The regulations of the government with particular reference to cereals and wine are reported, together with statistical data as to the exports and imports of cereals from 1881-1906, and as to the quantity, value, and kinds of wine produced and exported in 1906.

Business and mutual agricultural associations, A. Lecomte (*Paris* [*1906*], *pp. XII+297*).—This volume gives a brief historical sketch of the early agricultural societies in France, but deals more particularly with the development, objects, and functions of cooperative organizations for the purchase and sale of products, agricultural credit, and mutual insurance since 1884.

Cooperative societies [in Denmark], M. TISSERAND (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *7* (*1908*), *No. 1*, *pp. 49–52*).—Notes are given on the history, development, and present status of the agricultural cooperative associations in Denmark. The cooperative slaughter-houses in 1906 numbered 34, and the other societies in 1907 were as follows: For the purchase of farm materials 973, dairies 1,086, for the sale of milk and butter 198, and egg societies 790. In addition there were 3 general societies for the exportation of eggs, one of which had no less than 500 affiliated local societies with 40,000 members.

Agricultural organization in Cape Colony (*Natal. Agr. Jour. and Min. Rec.*, *10* (*1907*), *No. 9*, *pp. 1111–1115*).—The progress of cooperative societies during the year ended April 30, 1907, is discussed with particular reference to the wine and dairy industries. The wool industry heads the list with 22 associations. The total number of cooperative societies in operation in the colony was 53, the societies and syndicates in formation 56; and there were 31 schemes for cooperation not fully considered.

The invitation of Louisiana to German farmers and colonists, L. VOSS (*Louisianas Einladung an Deutsche Landwirte und Kolonisten. New Orleans*, *1907*, *pp. 53*, *figs. 17*, *map 1*).—This pamphlet in the German language is issued under the authority of the commissioners of agriculture and immigration for the purpose of calling attention to the opportunities the State affords to those desiring to engage in agriculture. The extent and classes of lands, and the climate, healthfulness, and the agricultural possibilities of Louisiana are discussed with a view to encouraging immigration.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter*, *10* (*1908*), *No. 4*. *pp. 25–32*).—The usual statistical data on the condition, acreage, yields, and prices of agricultural products in the United States and foreign countries are supplemented in this number with statistics on the condition of farm animals on April 1, and estimated losses during the year, compared with similar data for preceding years.

Agriculture [in South Carolina], E. J. WATSON (*Handbook of South Carolina. Columbia, S. C.*, *1907*, *pp. 236–392*, *figs. 154*).—A detailed account is given of the development of the agricultural industry in all its phases, including statistics of production. The estimated value in 1907 of all farm property was $173,836,290, and of agricultural products and live stock $157,229,881. The purpose of the article is to point out the agricultural possibilities of the State to prospective settlers.

Agricultural statistics, 1907, R. H. REW (*Bd. Agr. and Fisheries* [*London*], *Agr. Statis.*, *42* (*1907*), *Nos. 1*, *pp. 92*, *dgms. 3*; *2*, *pp. 93–172*, *dgms. 4*).—The returns of acreage under crops and in grass, number of live stock, number of agricultural holdings, meteorological observations, and value of land in Great Britain for the year ended June 4, 1907, are reported. Of a total acreage of 56,200,000, there were 32,243,447 acres under cultivation in 510,954 holdings of over one acre in extent, while 12,742,779 acres of land were utilized for grazing.

Agricultural statistics [of Natal], 1906 (*Natal Agr. Jour. and Min. Rec.*, *10* (*1907*), *No. 9*, *pp. 1064–1084*).—In addition to statistics on the acreage and yield of crops, meat imports and exports, dairy and poultry industries, and general farming in Natal and Zululand during 1906, the relative sizes of the various farm holdings are reported for the first time. Of 2,601 farms only 96 are below 50 acres in extent and 74 between 51 and 100 acres, while 443 and 773 farms range from 501 to 1,000 and 1,001 to 2,000 acres in extent, respectively.

Area and yield of certain principal crops in India, F. NOËL-PATON (*Area and Yield Princ. Crops [India Com. Intel. Dept.], 9 (1892–1907), pp. III+48*).—Summarized statements of meteorological conditions affecting the different crops, together with tabulated data as to acreage and yields, for the seasons from 1892–93 to 1906–7 are reported.

[Agricultural statistics of South Australia] (*Statis. Reg. So. Aust., 1906, pt. 3, pp. 1–95*).—Statistical data on land areas, extent under cultivation, kinds and yields of crops, number and classes of live stock, etc., are reported for the year 1906.

Yearbook of economics, R. CALWER (*Jahrbuch der Weltwirtschaft, Jena, 1907, pp. XVII+294*).—The chapter on agriculture in this publication gives statistics on the world's cereal acreage and production and the number of live stock by countries in 1905 compared with similar data for preceding years. The prices of such products in the chief markets of the world are included.

AGRICULTURAL EDUCATION.

The agricultural college and its relationship to the scheme of National education, E. J. WICKSON (*California Sta. Circ. 31, pp. 7*).—This is an address delivered at the meeting of the National Education Association at Los Angeles, Cal., in July, 1907, and deals with the development of agricultural education in this country and the work of the agricultural college in demonstrating the educational value of agricultural studies and in preparing teachers to render that value available. The writer believes that the agricultural college should assume a position of leadership "in the most important work of rendering the curricula of the lower schools more rational, their materials better suited to their environment and more effective in helping the youth to find himself in life work and associations."

Foreign agricultural instruction and organization (*La Enseñanza y la Organizacion Agricolas en el Extranjero. Madrid: Min. Fomento, Dir. Gen. Agr., Indus. y Com., 1907, pp. 329*).—Part 1 gives a brief account of the organization and present status of agricultural education in Germany, Austria, Belgium, the United States, France, Holland, Hungary, England, Italy, Japan, Portugal, Russia, Sweden, and Switzerland, together with more detailed information concerning some of the leading institutions. Part 2 describes the organization of the ministries of agriculture in Belgium, France, England, and Italy, and of this Department. Appendixes give the appropriations for and expenditures by the ministries of agriculture of Germany (for 1903), Belgium (for 1906), United States (for 1904, 1905, and 1906), France, England (for 1906–7), and Italy (for 1905–6).

Agricultural education in England and Wales (*Bd. Agr. and Fisheries [London], Leaflet 197, pp. 17*).—This leaflet contains a brief summary of the facilities for instruction in agriculture, dairying, horticulture, poultry keeping, and forestry in the colleges and institutions aided by the Board of Agriculture and Fisheries and the county councils in England and Wales; supplementary notes regarding each of the colleges as to length of course, tuition fees, and experimental farms maintained by the county councils in connection with these institutions for practical instruction and experimental work; and notes on institutions not receiving grants from the Board of Agriculture and Fisheries, and on county work.

Early agricultural education in Massachusetts, F. H. FOWLER (*Agr. of Mass., 1906, pp. 332–396*).—This is a compilation of notes and other data partly from official reports and partly from other published data concerning discussions, legislation, and other action relating to agricultural education in

Massachusetts from 1796 to 1863. The article deals with early movements for agricultural instruction in academies, historical data concerning the Thompson's Island Farm School, Bussey Institution, Smith's Agricultural School, State Reform School, Amherst College, Massachusetts Academy of Agriculture, Massachusetts Agricultural Institute, Massachusetts School of Agriculture, Massachusetts Board of Agriculture, Massachusetts Institute of Technology, and the Massachusetts Agricultural College. There are also discussions on a botanic garden, agriculture in the public schools, farmers' institutes, and the work of different societies. A considerable list of agricultural and horticultural papers, magazines, and books is given.

Agricultural education in West Virginia (*West Virginia Agricultural Resources and Possibilities. Charleston, W. Va.: State Bd. Agr., 1907, pp. 61-70*).—Data concerning the history and development of the University of West Virginia and its college of agriculture are given.

Popular agricultural education, L. S. HERRON (*Iowa Agr., 8 (1908), No. 5, pp. 207-210*).—The writer discusses the work of the agricultural colleges and emphasizes the need of secondary instruction in agriculture for farm boys who are not able to go to college. He maintains that "although secondary agricultural education may be superficial, yet we must remember that it is not the complete and scientific courses of study that are going to do the greatest good, but the course that we can get the farm boys to take." A brief description of different types of agricultural high schools is given.

Secondary education, W M. HAYS (*Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 73-83*).—This paper, which was presented at the meeting of the Society for the Promotion of Agricultural Science held at Lansing, Mich., on May 27, 1907, gives an account of the history and forms of secondary agricultural education in the United States, courses of study in agricultural high schools, and the history being made by the agricultural high schools.

Technical education in the South, B. AYRES (*Tradesman, 58 (1908), No. 9, pp. 372, 373*).—This article includes statements concerning the need of agricultural and technical education in the South and the importance of this education evidenced by the official recognition it has received, and a compilation of the proper time value of the technical education based on records made up by a large manufacturer for a number of years and covering the experience of thousands of men.

The teaching of agriculture in the public schools, A. C. ELLIS (*Bul. Univ. Texas, Gen. Ser. No. 15, pp. 56, figs. 9*).- This bulletin contains a discussion of how agriculture is taught and how it may best be introduced into the schools of Texas, and additional material concerning agricultural high schools of Wisconsin, the Minnesota Agricultural High School and College, the New York high school course of study in agriculture, the program for high schools in Indiana, a suggestive course in agriculture for Texas high schools, and excerpts from a number of publications of this Office relating to secondary and elementary education in agriculture.

Farm training for city lads, R. ARTHUR (*Agr. Gaz. N. S. Wales, 18 (1907), No. 8, pp. 702-706, figs. 6*).—A brief account of instruction given at the Labour Farm at Pitt Town to city boys who have a natural bent for country life but who are not in position financially to attend college. The course extends through 3 months, during which time instruction is given in milking, separating cream, attending to a dairy, feeding cows and pigs, and field work. About 70 boys have been or are going through the course. There is a great demand for the services of these boys among farmers all over the country.

The children's school farm at the Jamestown Exposition, H. G. PARSONS (*Va. Jour. Ed., 1 (1907), No. 1, pp. 6-9, figs. 3*).—A description of the children's school farm exhibit of the International Children's School Farm League at the Jamestown Exposition and an explanation of the significance of the movement which it typifies.

MISCELLANEOUS.

Twentieth Annual Report of Arkansas Station, 1907 (*Arkansas Sta. Rpt. 1907, pp. 89*).—This includes the organization of the station, reports of the director and heads of departments, a chronological list of the station bulletins, a financial statement for the fiscal year ended June 30, 1907, and reprints of Bulletins 92–95.

Twenty-fifth Annual Report of New York State Station, 1906 (*New York State Sta. Rpt. 1906, pp. IX+486*).—This comprises the organization list of the station, a financial statement for the Federal funds for the fiscal year ended June 30, 1906, and for the State funds for the fiscal year ended September 30, 1906, a list of the periodicals received by the station, meteorological observations and reprints of Circulars 6 and 7 abstracted elsewhere in this issue, and reprints of Bulletins 275–279 and 281-284 and Technical Bulletins 1–3, which have been previously noted.

Director's report for 1907, W. H. JORDAN (*New York State Sta. Bul. 295, pp. 381–402*).—A review of the work and publications of the station during the year.

Finances, meteorology, index (*Maine Sta. Bul. 150, pp. 329–345+VIII*).—This contains the organization list of the station, meteorological observations noted elsewhere in this issue, a financial statement for the fiscal year ended June 30, 1907, an index to Bulletins 138–150 which collectively make up the twenty-third annual report of the station, a list of bulletins and of miscellaneous publications for the year, and announcements and notes on the work, personnel, and equipment of the station.

The Plains (*Colorado Sta. Bul. 123, pp. 32*).—This bulletin contains reprints of press bulletins on advice to Plains settlers, crops for unirrigated lands, dairy work for Plains settlers, preparation of seed bed, summer culture to conserve moisture, acclimated seed, potatoes on the Plains, wind-breaks and shelter belts for the Plains, and grasshoppers upon the Plains; similar articles not previously printed on raising hogs on the Plains, and the type of milling wheat for the Plains; and a more extended article on rainfall upon the Plains, which is abstracted on page 918 of this issue.

Summary.—Texas Bulletins Nos. 1 to 94, inclusive (*Texas Sta. Bul, 98, pp. 97.*)—Abstracts of these bulletins are given.

Twenty-third Annual Report of the Bureau of Animal Industry, 1906 (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1906, pp. 478*).—This includes a report of the Chief of the Bureau for the fiscal year ended June 30, 1906, numerous articles abstracted elsewhere in this issue, a list of the publications of the Bureau during 1906, the rules and regulations of the Secretary of Agriculture relating to animal industry issued in 1906, and copies of the meat inspection law of June 30, 1906, and the amended law regulating the transportation of live stock.

Experiment Station Work, XLV (*U. S. Dept. Agr., Farmers' Bul. 317, pp. 32, figs. 6*).—This number contains articles on the following subjects: The farm home, lining of ditches and reservoirs, cement pipe for irrigation and other purposes, pollination of forced tomatoes, increasing the productiveness of corn, shrinkage of corn in cribs, grain for cows at pasture, starters for ripening cream, water pans for poultry, and a catching hook for poultry.

NOTES.

Alabama College and Station.—Ward Giltner, instructor in veterinary science in the college and assistant in veterinary science in the station, has resigned to accept a position as research assistant in the department of bacteriology in the Michigan College and Station.

Tuskegee Institute and Station.—C. S. Woodard, a recent graduate of the college of agriculture of Ohio University, has been given charge of the beef herd of 150 cattle. G. W. Owens has resigned as dairyman and animal husbandman to assume charge of the agricultural department of the Virginia State Normal and Industrial School at Petersburg.

California University.—President Benjamin Ide Wheeler has been nominated by the trustees of Columbia University and appointed by the Prussian ministry of education as Theodore Roosevelt professor in Berlin for 1909 and 1910.

Colorado Station.—W. G. Sackett, assistant bacteriologist in the Michigan College and Station, has been appointed bacteriologist in the Colorado Station, and entered on his duties in May.

Connecticut College and Station.—C. K. Graham has resigned as poultryman to accept the directorship of the agricultural department of the Hampton Normal and Agricultural Institute.

Florida Station.—R. D. Algee, secretary, and William Hess, gardener, have resigned. R. N. Wilson has been appointed temporary assistant in chemistry, beginning work June 10.

Georgia Station.—W. L. Owen has resigned as bacteriologist to accept a corresponding position with the Louisiana Sugar Station at Audubon Park.

Hawaii Station.—J. G. Smith has resigned as special agent in charge, to engage in commercial work. He has been succeeded by Dr. E. V. Wilcox of this Office, who has been in charge of the departments of economic zoology, entomology, and veterinary science of *Experiment Station Record* for about ten years.

Illinois University and Station.—At the request of the high school conference, through its committee on household arts in the high schools, Miss Helena M. Pincomb has been appointed to take charge of and develop household science work in the high schools of the State. She will visit the schools that are interested in this subject, will speak at teachers' institutes, and conduct the summer school work at the household science department of the university, in which special attention will be given to the needs of teachers of household arts in the secondary schools.

H. W. Mumford, head of the department of animal husbandry, is making a somewhat extended trip for the purpose of studying the subject of beef production in South America, especially in Argentina. He sailed in February and will return by the west coast, reaching the university not far from the middle of June.

Maine University and Station.—The death is noted of Gilbert M. Gowell, who died by his own hand on May 6 while suffering from melancholia. Professor

Gowell had been connected with the university for about 25 years, resigning as professor of animal industry at the end of the last academic year and from his station work in poultry breeding on January 1, 1908. He was 63 years of age.

Maryland College and Station.—At the last session of the legislature an act was passed making the board of trustees of the college ex-officio the State board of agriculture, and the director of the station the secretary of that board. Robert B. Mayo, M. D. (Johns Hopkins), has been appointed to the station staff for investigations on poultry diseases, and L. B. Broughton, a recent graduate of the college, has been appointed assistant chemist, vice J. J. T. Graham, resigned.

Massachusetts College and Station.—The legislature has granted a deficiency appropriation of $23,600, increased the appropriation for maintenance by $13,000 for the ensuing year, and by $20,000 annually for succeeding years, and appropriated $4,000 for repairing and refitting the station building, $34,000 for the erection and equipment of a horticultural greenhouse and attached building for instruction, $5,000 for additional equipment in the college, and $17,000 for repairs and miscellaneous purposes, making an aggregate of approximately $93,000.

Michigan College.—A summer school, to open June 29 and continue four weeks, is announced for the preparation of teachers who wish to teach agriculture. W. H. French, the recently appointed professor of agricultural education, will have charge of the school.

Minnesota University and Station.—A summer school of forestry at Itasca State Park is announced to open July 1 and continue until August 13. The course is open to men and women, and includes instruction in elementary silviculture, forest mensuration, botany, entomology, geology, and surveying.

H. M. Bush has been appointed assistant in agriculture, and has entered upon his duties.

Mississippi College and Station.—R. P. Hibbard, of the Bureau of Plant Industry of this Department, has accepted an appointment as bacteriologist, his work for the present to be chiefly in dairy bacteriology.

Missouri University and Station.—The resignations are noted of Norman D. Hendrickson, assistant in agricultural chemistry, to accept a position with the Bureau of Chemistry of this Department at its Chicago Food and Drug Inspection Laboratory; of Frank G. King, assistant in animal husbandry, to become assistant to the secretary of the State board of agriculture; and of H. S. Wayman, instructor in dairying and assistant dairyman, to engage in commercial work, the two last-named resignations becoming effective June 1.

C. Stuart Gager, Ph. D., director of the research laboratories of the New York Botanical Gardens, has been appointed professor of botany in the university and botanist to the station. Doctor Gager will enter upon his duties September 1.

Montana College and Station.—A special dairy train in charge of the dairyman toured the State during May. The train was made up of two box cars fitted up with a milking machine, a pasteurizer, and other dairy equipment, power being supplied by a gasoline engine installed in one car. Four of the best dairy cows at the station were also taken along and used in demonstrations in connection with the lectures.

Nebraska University and Station.—F. D. Heald, professor of agricultural botany in the university and botanist in the station, has resigned to accept the professorship of botany in the University of Texas.

New Jersey College and Stations.—The State legislature has passed a law establishing a State live-stock commission, which is given authority to purchase and maintain for service stallions of draft and coach types, and to make rules and regulations as to the purchase, distribution, and use of stallions and other breeding animals. An appropriation of $20,000 was made available for initial expenses, with $5,000 annually for maintenance. F. C. Minkler, animal husbandman of the station, and recently appointed instructor in animal husbandry in the college, has been appointed executive officer of the commission.

New Mexico College and Station.—Luther Foster retired from the presidency of the college at the close of the academic year to devote his attention entirely to the directorship of the station. The retirement of J. J. Vernon as agriculturist of the college and station is also announced.

North Dakota College.—H. L. White, of the medical college of the University of Vermont, has been elected assistant professor of physiological chemistry and toxicology, and J. W. Ince, instructor at McGill University, has been elected as instructor in agricultural chemistry.

North Carolina College and Station.—In recognition of the long services to southern agriculture of President George T. Winston, he has been tendered a pension by the Carnegie Foundation for the Advancement of Teaching, and his retirement is announced to take effect July 1.

One of the station barns and the superintendent's house was destroyed by fire May 25, the loss including practically all the farm implements belonging to the station. The cause of the fire has not been determined. It is planned to replace the buildings at an early date.

Ohio University and Station.—The college of agriculture received State appropriations of $5,000 for the equipment of the agricultural building and $4,000 for the equipment of the agricultural chemistry laboratory. The station was granted $84,000, of which $20,500 was for administration, $8,150.87 for agronomy, $6,327.92 for animal husbandry, $4,932.62 for botany, $2,712.30 for entomology, $3,500 for chemistry and nutrition, $10,369.74 for cooperative experiments, $8,133.34 for forestry, $8,086.24 for horticulture and horticultural inspection, $8,286.97 for soils, and $3,000 for a printing press, equipment, and other purposes.

The following appointments have been made in the station: Joseph H. Gourley as assistant horticulturist; Arnold W. Meyer, of Columbia University, as assistant in the nutrition investigations, and H. C. George, now engaged in the station cooperative experiments, as assistant experimentalist. Messrs. Gourley and Meyer will enter upon their duties September 1.

Oklahoma College.—According to press reports a summer school for teachers will be held during July under the direction of Charles Evans as dean. It is also reported that the State legislature has passed a bill requiring the teaching of agriculture in the public schools of the State and providing for the establishment of five purely agricultural schools, one for each supreme court district in the State. Two of these schools are to be started this year, two in 1910, and one a year later. The bill makes these schools secondary institutions and carries an initial appropriation of $20,000.

Oregon College.—E. L. Potter, a recent graduate in animal husbandry of the Iowa College, has been appointed instructor in animal husbandry, with charge of the department.

Pennsylvania College and Station.—Charles F. Noll has been appointed assistant in experimental agronomy and has entered upon his duties.

Porto Rico Station.—At its recent session the legislature appropriated $20,000 for the construction of a new station building. This building will house the offices and laboratories of the station and will be of colonial design.

Ernest G. Ritzman, of the Bureau of Animal Industry of this Department, has been appointed assistant animal husbandman, and entered upon his duties May 25.

South Dakota College.—A school of agriculture has been established in connection with the college and will be opened the first Monday in November. The course will extend over three years of five months each, and is intended to prepare young men for life on the farm. Dr. A. A. Brigham, formerly of the Rhode Island College and Station and more recently connected with the Columbia School of Poultry Culture, Waterville, N. Y., has been elected principal of the school, and Miss Jessie M. Hoover, preceptress.

Tennessee University and Station.—Morrill Hall, the new agricultural building, was dedicated May 28, the speakers including the State superintendent of public instruction, the State commissioner of agriculture, and others. The dedicatory address was by Dean Davenport, of the Illinois University and Station. In connection with the exercises a three-day farmers' convention was held at which the various agricultural organizations of the State were represented. Several sessions were devoted to topics pertaining to agricultural education, in which the East Tennessee Educational Association cooperated.

The station has under cultivation a 20-acre experimental tract at the State fair grounds. The plats are so arranged as to be as instructive as possible at the date of holding the fair and will be used for demonstration work at that time.

Utah College and Station.—Walton Kirk Brainerd, at present instructor in dairying and animal husbandry in the West Virginia University, has been appointed professor of dairy husbandry in the college and dairyman in the station, and will enter upon his duties July 1.

Vermont University and Station.—R. M. Washburn, at one time acting professor of dairy husbandry at the University of Missouri and at present dairy commissioner of that State, has been appointed professor of dairy husbandry and dairy husbandman, vice C. L. Beach, whose resignation has been previously noted.

Wyoming University.—Dr. Charles Oliver Merica was elected president May 9 and entered upon the duties of the office at once.

Agricultural work in Manchuria.—E. C. Parker, assistant agriculturist in the Minnesota University and Station, and W. H. Tomhave, assistant in animal husbandry in the Pennsylvania College and Station, have accepted three-year commissions as expert advisers in agriculture to the Manchurian government and will enter upon their duties about August 15. Among other lines of work the government purposes organizing an experiment station at Mukden and eventually an agricultural college in Manchuria.

Agricultural Education in Hawaii and Porto Rico.—The Secretary of the Interior has extended to Hawaii and Porto Rico the benefits of the Morrill and Nelson acts, thereby making available for the fiscal year ending June 30, 1908, and succeeding years, the funds provided by those acts for instruction in agriculture and the mechanic arts. In Porto Rico the legislature has supplemented these appropriations by grants of $30,000 for the construction of buildings and $10,000 for the purchase of land at Mayaguez, where it is planned to locate a college of agriculture and mechanic arts as a department of the University of Porto Rico. The legislature also granted $3,000 to the Instituto de Agricultura Artes y Oficios of Lajas for repairs and maintenance, and extended until June 30, 1910, the time for the establishment of the agricultural institutes provided for by the act of 1907.

Change in Scope of the Bussey Institution.—The Bussey Institution established at Jamaica Plain, Mass., in 1870, in accordance with the will of Benjamin Bussey, as a school of agriculture and horticulture of Harvard University, is to be closed as an undergraduate institution at the end of the present academic year. In its stead it is planned to maintain an institution for advanced instruction and research in agricultural problems. The reorganization in faculty consequent upon this change is not yet complete, but as announced includes the following appointments: W. M. Wheeler, professor of economic entomology; W. E. Castle, professor of animal heredity; E. C. Jeffery, professor of experimental plant morphology, and Dr. Theobold Smith, professor of comparative pathology.

Agricultural Measures Passed by Congress.—The chief agricultural legislation enacted by Congress at its recent session was embodied in the agricultural appropriation act, which is summarized elsewhere in this issue. Provision was made for the publishing of 100,000 copies of a revision of the special report on the diseases of cattle, and an increase of 7,682 acres in the allotment of public land to the State of Kansas under the Morrill Act of 1862 was authorized on the ground that of the land originally selected by the State at the rate of $2.50 per acre this amount should have been listed at $1.25, thereby entitling the State to a corresponding increase in quota.

A bill introduced by Senator Dick, of Ohio, to apply a portion of the proceeds of the sales of public lands to the establishment and maintenance of schools of mines and mining in connection with the colleges of agriculture and mechanic arts was passed by the Senate May 15 without amendment and referred in the House to the Committee on Mines and Mining.

A bill introduced by Representative Mann, of Illinois, to regulate commerce in adulterated and misbranded seeds was reported from the House Committee on Agriculture and is pending on the House Calendar. The other agricultural bills introduced, including the various measures for the support of branch experiment stations, agricultural high schools, and agricultural instruction in normal schools, were not reported from the committees to which they were referred.

National Conservation Commission.—A commission on the conservation of the national resources has been appointed by President Roosevelt, its work to be divided into sections of waters, forests, lands, and minerals. In addition to Senators and Representatives, the personnel of this commission is as follows: Gifford Pinchot, chairman; W J McGee, F. H. Newell, Geo. F. Swain, Henry S. Graves, Overton W. Price, Chas. McDonald, Chas. R. Van Hise, John Hays Hammond, Irving Fisher, and J. A. Holmes.

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EXPERIMENT STATION RECORD.

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Many of the intricate problems in agriculture which attempt is being made to work out lead back into the realm of pure science. This is true, although the subjects themselves as viewed from their practical bearings may seem remote from it. Their successful solution calls not only for familiarity with these sciences and the methods of investigation which have been developed in them, but also for a sympathy with the point of view of pure science. Such agricultural science as we have is built upon the primary sciences and their applications, and we must continue to draw upon them and their methods and hence to keep in close touch with their progress. In our attempts to develop the applied science of agriculture it must not be forgotten "that the new is built upon the old and includes the old."

Much of our investigation in agriculture has started out in too narrow a way. It has considered the subject simply as it is presented in the practical problem, without sufficient attention to analyzing it into its primary factors from a scientific standpoint. To that extent it has often been misdirected and has not been fundamental. We have spent years in experimenting on the fertilizer requirements of specific crops, with very little study as to the physiological phases of the question, the function which the various constituents play, or the changes they induce. We know very little of what takes place in the plant or the soil as a result of our treatment. Until the theory of the use of fertilizers has been worked out and the reasons for the apparent results which follow their use, we shall have no sound basis for the interpretation of the results of practical experiments or for teaching the subject of plant nutrition.

The advantage of agricultural science over the individual sciences as applied to agricultural problems should lie in its special point of view and in the bringing of various sciences to bear on these problems. For its purposes the boundaries of the primary sciences are overstepped. The investigator in that field is not restricted to a single science, but employs the teachings and the methods of several, as his case requires, acting as a connecting or coordinating agent. This cosmopolitan relationship calls for widespread familiarity with the whole field of natural science. Its danger is too close specialization and disregard of everything in the pure sciences which does not bear directly and quite immediately on the field of agriculture. Such a course tends to narrowness and to superficiality on the part of its adherents.

This is a real danger in the development of a corps of agricultural workers in this country. Too close and especially too early specialization in his study and interests is a serious disadvantage to the worker in agricultural science. It not only narrows down his view of the field of science as a whole, but it fails to bring him into sympathetic relations with it. His principal interest in these sciences is often restricted to what he can get out of them. Although his problems may lie in the field of agronomy, he should never forget that such scientific work as he does will in reality be in such sciences as botany and chemistry and will be measured by their standards, and hence his preparatory equipment must almost of necessity include a good grounding in these departments as well as in their special applications. And, similarly, preparation for research in animal nutrition should include a quite thorough knowledge of animal physiology and physiological chemistry, for without this it will be almost impossible to follow the progress of investigation and to take advantage of it in conducting special researches.

The preparation of the student for research in agriculture requires a quite different course of training from that for farming occupations. Our agricultural courses in themselves do not furnish it. They not only do not take the student far enough but they are too specialized, and the specialization in science and its applications begins too early in the course. The objection to some of these courses as a foundation for advanced study is that the student often acquires a rather narrow view of what will be helpful in his future study, as a result of which he continues specializing in his graduate work, selecting only such parts of the sciences he takes up as seem to have a direct bearing on his field. Not having had a thorough training in science in his regular course, he may fail to acquire it at all even though he takes considerable graduate work. To this extent his preparation is superficial and has developed a wrong point of view. He does not fully appreciate the needs of a broader outlook into science, and the tedious and laborious methods of the older sciences do not appeal to him. Instead, he looks to a short cut in solving agricultural questions or in getting an answer which will meet practical requirements, and his method put in practice usually involves borrowing rather than building.

Fortunately, it should be said, these conditions of environment which surround the embryo investigator are being steadily improved.

with the raising of standards for entrance and for instruction at the agricultural colleges, and with the increased flexibility of these courses. They have thus become more adaptable to the needs of various classes of students.

The advantages to station work of the broad view afforded by training in the older sciences have been shown in a number of instances the past year. Men have come into the station work who brought to it a thorough grounding in science, although they had but little information regarding the practice of agriculture or its particular problems. When these problems have been laid before them they have proceeded to analyze them and work them out according to the methods of their science, cutting away from stereotyped methods and approaching the subject from a new point of view. In this way the accumulated records of chicken breeding have been subjected to biometric study, and the changes in cheese making have been approached from the standpoint of physical chemistry.

The result has been illuminating. It has emphasized the advantage of the man who has broad and thorough training in science, and has suggested this class of investigators as the channel through which progress in fundamental inquiries may be most rapid. The freedom for such investigation which has come in the past two years, and release from other duties of a miscellaneous character, is attracting to the experiment stations a considerable number of men trained in the pure sciences, who have heretofore looked askance at them as a field of activity.

Recent progress in physiological chemistry points to a line of inquiry which may be helpful in understanding certain processes in the animal body. It illustrates an attempt to get beyond an empirical fact long known and discover the fundamental reason lying back of it. It shows the breadth of view required of the investigator, and the account which he must take of the progress of science.

A thorough understanding of the fundamental laws of nutrition must consider the chemistry of cells and organs as well as the chemistry of the body as a whole. Within the last few years physiologists and physiological chemists have carried on researches in body chemistry which have yielded very important results, and may have a bearing on difficult questions relating to animal nutrition. For instance, investigations have been conducted by Mendel and his students at Yale University on the growth and development of the animal body, particularly with pigs and poultry. These investigations have dealt with the composition and chemical changes which are characteristic of developing organisms, and the equipment of such organisms (digestive ferments, secretive glands, etc.), for utilizing the nutritive materials presented to them.

The investigations with hens' and ducks' eggs incubated for different periods have given new evidence regarding the synthesis puri in embryonic life, the fresh egg being practically free from puri. In the case of the embryonic pig it was found that the developing muscle tissue contained glycogen during embryonic life, which during the early stages of this period had a relatively greater digesting power than that of the liver tissue; while the embryo liver in the early stages of development is entirely free from glycogen and only gradually acquires its characteristic digesting capacity.

The influence of the nervous system in connection with the activities of the body has long been regarded as very important, but more recent study indicates the action of another series of agents. These are excitatory substances of chemical character, which act as a connecting or controlling mechanism in coordinating the activities of various organs.

We are accustomed, as Starling says, to regard each act in the life of an animal as a link in a never-ending chain of adaptations to the environment, each act being a complex of a number of mutually adapted activities affecting very different parts of the body. This united action of several different organs seems to call for the existence of some connecting or controlling agent. In many cases this is represented by the nervous system, but in many others it now appears to be effected by chemical means, which are present in the internal nutrient fluid of organisms, and function not as foods in the ordinary sense but as excitatory substances.

For these chemical compounds, called "reizstoffe" by the Germans, Starling suggests the name of "hormones." These bodies, it is found, can be isolated and studied as to their nature and function, and this has been done successfully in the case of certain of them. They are believed to be nonassimilable and to yield no appreciable amount of energy, but their importance depends on their dynamic effects on the living cells.

A striking illustration of this chemical stimulation is met with in the alimentary tract. The secretion of digestive juices by organs which are remote from each other and apparently without connection is found to be brought about by definite substances for which the name "secretins" has been proposed. It appears that after digestion has begun by psychic stimulation the digestive processes are continued entirely by chemical stimulation, the stimulating material or materials first formed passing into the blood and being carried to the next set of organs which require stimulation in order to pour out the digestive juice.

This investigation represents an attempt to determine not merely what the return will be from a certain feeding stuff, or how much of it is digested, but the manner in which digestion takes place, the mechanism of the process, and the reason which lies back of the observed result. Evidently we are only at the threshold of this new line of study, and influences of this sort may possibly serve to throw some light on the differences which are commonly observed in the effect of similar feeds on different individuals or under different conditions. The primary effect of the excitatory substances is to excite increased activity of the responsive organs, and, as Starling points out, such a state of increased functional activity can not be without significance for the nutrition of the tissues concerned.

One of the most striking illustrations of the action of these excitatory bodies was observed in connection with the secretion of milk. It was found that during the embryonic life of mammals the young organism produces a definite chemical substance which passes into the circulation of the parent organism and is responsible for the growth and development of the mammary glands. This mammary hormone or excitatory substance can be isolated, and properly administered will produce all its characteristic effects. After such stimulation ceases, at birth, the gland substance which has accumulated undergoes autonomous dissimilation with the formation of milk, i. e., enters into a state of prolonged activity. Milk secretion is found to be due to the removal of a stimulus and not to the production of a new stimulating substance. The seat of the production of the hormone, the quantity in which it is produced, and the influences which surround it remain for future investigation.

These examples show, as Starling states, that it is possible by chemical means to influence either the functional or the nutritional condition of a tissue, in the direction either of increased or diminished activity, and that such means are normally employed by the animal body for coordinating the activities and growth of widely separated organs. These bodies are of a relatively simple chemical character, and are susceptible of isolation and even, as in the case of adrenalin, of synthesis. They are evidently widespread in their distribution and effects, and it is suggested that future investigations may result in a series of agents by which many of the most important functions of the body may be controlled.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

New unit for energy, A. T. JONES (*Science, n. ser., 27 (1908), No. 679, p. 28*).—The author calls attention to the fact that the word "therm," proposed by Armsby (E. S. R., 19, p. 704), as a convenient unit to express 1,000,000 gram-calories, has been used occasionally to mean the gram-calorie, and he suggests the use of the terms "kilocalorie" and "megacalorie." These terms, he points out, are in accord with other units employed in physical measurements.

On fermentation, A. E. TAYLOR (*Univ. Cal. Pubs., Path., 1 (1907), No. 8, pp. 87-341*).—A series of lectures delivered at the University of California. The subjects treated include the theory of catalysis applied to fermentation, the fermentation of carbohydrates, protein, and fat, the nature of ferments and the reactions of fermentations, the specificity of ferments, and the rôle of fermentations in metabolism.

The analysis of the cleavage products of egg albumen, P. A. LEVENE and W. A. BEATTY (*Biochem. Ztschr., 4 (1907), No. 4-6, pp. 305-311*).—The authors identified, as cleavage products per 100 gm., 2 gm. glycocoll and alanin, 17 gm. amino-valeric acid and leucin, 8.75 gm. glutaminic acid, 0.5 gm. inactive α-prolin, and 1.25 gm. tyrosin.

The hydrolysis of proteids by means of dilute sulphuric acid, P. A. LEVENE and C. L. ALSBERG (*Biochem. Ztschr., 4 (1907), No. 4-6, pp. 312-315*).—A brief report showing the kinds and amounts of cleavage products obtained from gelatin, casein, and edestin.

Hydrolysis of amandin from the almond, T. B. OSBORNE and S. H. CLAPP (*Amer. Jour. Physiol., 20 (1908), No. 4, pp. 470-476*).—Of the 59 per cent of material obtained by hydrolysis of amandin the following are the constituents obtained in the greatest proportion: Glutaminic acid 23.14 per cent, arginin 11.85 per cent, aspartic acid 5.42 per cent, leucin 4.45 per cent, and ammonia 3.70 per cent. Tryptophan was not determined.

Hydrolysis of the proteins of maize (Zea mays), T. B. OSBORNE and S. H. CLAPP (*Amer. Jour. Physiol., 20 (1908), No. 4, pp. 477-493*).—The hydrolysis products of zein, constituting 61.53 per cent of the material taken, were alanin 2.23 per cent, valin 0.29 per cent, leucin 18.60 per cent, prolin 6.53 per cent, phenylalanin 4.87 per cent, aspartic acid 1.41 per cent, glutaminic acid 18.28 per cent, serin 0.57 per cent, tyrosin 3.55 per cent, arginin 1.16 per cent, histidin 0.43 per cent, and ammonia 3.61 per cent. Glycocoll, lysin, and tryptophan were not present. The 45.44 per cent cleavage products isolated from the alcohol soluble proteid of maize were glycocoll 0.25 per cent, leucin 6.22 per cent, prolin 4.99 per cent, phenylalanin 1.74 per cent, aspartic acid 0.63 per cent, glutaminic acid 12.72 per cent, tyrosin 3.78 per cent, arginin 7.06 per cent, histidin 3.00

per cent, lysin 2.93 per cent, and ammonia 2.12 per cent. The presence of tryptophan was demonstrated. Alanin, valin, and serin were not isolated.

"These figures show that zein, like the other alcohol soluble proteins, is characterized by yielding a very small percentage of arginin and histidin, no lysin, and much ammonia and prolin. The proportion of glutaminic acid is much less than that found in the other alcohol soluble proteins, hordein and gliadin, while the proportion of leucin is very much greater. Unfortunately the amount of the alkali soluble protein which was available for hydrolysis was too small to enable us to obtain satisfactory results for quantitative comparison. It is interesting, however, to note that those amino acids which are lacking in zein are all present in notable proportions in this protein, so that the mixture of the proteins as they occur in this seed yields all of the amino acids usually obtained from protein substances."

The hydrolysis of gliadin from rye, T. B. Osborne and S. H. Clapp (*Amer. Jour. Physiol., 20* (*1908*), *No. 4, pp. 494–499*).—The authors determined the products obtained by hydrolysis of rye gliadin and report the results in comparison with similar data which have been reported for wheat gliadin (E. S. R., 19, p. 762), hordein of barley (E. S. R., 19, p. 611), and zein of maize (see above). The 64.31 per cent hydrolysis products obtained from rye gliadin are made up as follows: Glycocoll 0.13 per cent, alanin 1.33 per cent, leucin 6.30 per cent, prolin 9.82 per cent, phenylalanin 2.70 per cent, aspartic acid 0.25 per cent, glutaminic acid 33.81 per cent, serin 0.06 per cent, tyrosin 1.19 per cent, arginin 2.22 per cent, histidin 0.39 per cent, and ammonia 5.11 per cent. Valin and cystin were not isolated, but tryptophan was found to be present.

"The agreement between the analyses of the gliadin from wheat and rye is so close that the conclusion that differences exist between the preparations from these two seeds is not justified. Between hordein, zein, and gliadin, however, such distinct differences exist that, taken in connection with the differences in ultimate composition and properties, there can be no question that these are distinctly different proteins. These hydrolyses show that the alcohol-soluble proteins of the cereals form a distinctly characterized group which differ from all the other protein substances thus far analyzed. These differences are especially shown in their high content of prolin, glutaminic acid, and ammonia, and their low content of arginin and histidin and absence of lysin. Zein is especially worthy of note, as it lacks glycocoll, lysin, and tryptophan, which are obtained from nearly all the other proteins."

The condensation of acetaldehyde and its relation to the biochemical synthesis of fatty acids, H. S. Raper (*Jour. Chem. Soc.* [*London*], *91* (*1907*), *No. 541, pp. 1831–1838*).—The investigation reported is a contribution to the question of the possible formation of fatty acids in animals from carbohydrates by condensation of "some highly reactive substance containing two carbon atoms and formed in the decomposition of sugar."

The characteristics, especially the polarization, of saccharin and alkali saccharinate, E. Rimbach and E. Heiten (*Liebig's Ann. Chem., 359* (*1908*), *No. 3, pp. 317–335*).—Experimental data are reported and discussed.

The sources of arsenic in certain samples of dried hops, W. W. Stockberger (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 41–46*).—From the investigations mentioned the following conclusions are drawn:

"Traces of arsenic may occasionally be found in dried hops irrespective of their geographical origin.

"If available arsenic is present in the soil it may be taken up by the hop plant under favorable conditions.

"Except in rare cases the amount of arsenic derived from the soil by the hop plant is probably smaller than 0.01 grain per pound of dry hops, which is the smallest amount regarded as deleterious by the Royal Commission on Arsenical Poisoning in England.

"By the use of impure sulphur during the process of curing, hops may be contaminated with arsenic, which will be concentrated in the lower layers on the kiln floor, with the result that certain samples may show an amount greater than 0.01 grain per pound.

"The probability of hops acquiring arsenic from what seems to be a very ready source may be much lessened by employing only the very highest grades of purified sulphur in hop curing, and the quantity used should be reduced to the lowest possible limit."

Some technical methods of testing miscellaneous supplies, P. H. WALKER (*U. S. Dept. Agr., Bur. Chem. Bul. 109, pp. 48*).—The methods described are those which have been found useful in the Bureau of Chemistry in the examination of such materials as paints and paint materials, inks, lubricating oils, soaps, glue, glycerin, and other articles purchased by the Government. In general these methods have been compiled from a variety of sources, and modifications that were found necessary have been made.

Utilization of the by-products of sugar factories and distilleries, L. LEMAIRE (*Engrais, 22 (1907), Nos. 40, pp. 953–957; 41, pp. 979–981; 47, pp. 1123–1127*).—Various processes for extracting potash and ammonia salts and tartar from such by-products are described, as well as the direct uses of some of them as feeding stuffs and fertilizers.

Poisonous beans called Hungarian beans, ÉVESQUE, VERDIER, and BRETIN (*Jour. Pharm. et Chim., 6. ser., 26 (1907), No. 8, pp. 348, 349*).—According to the authors' conclusions, morphological and histological characteristics are not sufficient for establishing the nontoxicity of beans. The intensity of coloration of picrate of soda paper and the rapidity with which it is produced serves as an indication of the amount of hydrocyanic glucosid present. A method is described for the rapid determination of the glucosid.

On the determination of ammonia, A. RONCHÈSE (*Compt. Rend. Soc. Biol. [Paris], 62 (1907), No. 16, pp. 867–869; abs. in Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 1, pp. 42, 43*).—The author explains the application of his method, which has already been noted (E. S. R., 19, p. 407), to the examination of ammoniacal salts, urea, and urine and to the determination of total nitrogen and urinary ammonia.

New indirect gravimetric methods for carbon dioxid and nitrogen in nitrates, P. JANNASCH (*Abs. in Chem. Zentbl., 1908, I, No. 4, pp. 410, 411*).—Methods of determining carbon dioxid and nitrogen in nitrates by fusion with sodium tungstate and tungstic acid which drives off these substances are described. The carbon dioxid may be determined either by loss in weight or it may be collected when driven off from the fusion in soda-lime and weighed.

Note on the Dyer method for the determination of plant food in soils, F. T. SHUTT and A. T. CHARRON (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 295*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society in which the authors reported results of studies of the influence of time of digestion and volume of solution in the Dyer method. The results indicate no reason for departing from the time and volume limits given by Dyer in his original account of the method.

On free humus acids in upland moor soils and their determination, A. BAUMANN and E. GULLY (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 1, pp. 1–6*).—The nature and importance of humus acids in moor soils are briefly discussed, and the following method of testing for acidity due to such acids is described:

To 100 cc. of a water solution of 2 gm. of potassium iodid and 0.1 gm. of potassium iodate add 1 gm. of the soil in case of peaty soils, but a larger amount in case of mineral soils. Allow the mixture to stand with frequent shaking for ¼ hour, and filter. Test for iodin set free by the organic acids by adding a few drops of the filtrate to a dilute starch solution. For exact determination of the free acids the authors refer to a simple eudiometric method described by one of them several years ago.

An improved method of determining acidity in soils, H. Süchting (*Ztschr. Angew. Chem., 21 (1908), No. 4, pp. 151–153; abs. in Chem. Zentbl., 1908, I, No. 8, p. 760; Analyst, 33 (1908), No. 385, p. 142; Jour. Chem. Soc. [London], 94 (1908), No. 545, II, pp. 231, 232; Bul. Soc. Chim. France, 4. ser., 4 (1908), No. 8, p. 610*).—The method described is a modification of Tacke's method which is based upon the decomposition of calcium carbonate when mixed with acid soils (E. S. R., 9, p. 32).

In the method described 10 to 30 gm. of humus soil, or 30 to 50 gm. of mineral soil, is mixed with water and a moderate excess of calcium carbonate. The carbon dioxid evolved is removed with a stream of hydrogen, 50 cc. of 20 per cent hydrochloric acid is then added, and the carbon dioxid thus set free from the calcium carbonate not previously decomposed by the soil acids is collected in standard solution of caustic soda and determined by titration in the usual manner.

Eliminating the citric acid from the soil solution (*Internat. Sugar Jour., 10 (1908), No. 110, pp. 59, 60*).—The method which has been worked out in the laboratory of the sugar experiment station at Lima, Peru, is as follows:

"To the 750 cc. of the filtered solution which contains iron, potash, lime, etc., add a few drops (2 or 3 cc.) of HNO_3; evaporate to a volume of about 100 cc. Transfer the evaporated solution to a 200 cc. Kjeldahl digestion flask used for the nitrogen determination, and continue the evaporation in this flask until the solution is reduced to 50 or 75 cc. Add 30 or 40 cc. of strong HNO_3, continue the boiling and evaporating until reddish fumes are given off and then boil 5 or 10 minutes longer. Remove the flask, transfer the contents to a small evaporating dish, add a little HCl (3 or 4 cc.), evaporate to dryness. If the operation is carefully conducted there will be no citric acid remaining. The work from this point is continued in the regular manner."

The volatilization of certain mineral elements in ashing plant materials, W. W. Skinner (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 296*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society. This paper gives results of studies on the loss of sulphur when organic substances are ashed by the ordinary method as compared with the sulphur obtained by the peroxid and combustion in oxygen methods. "Analyses are given of 2 samples of cotton-seed meal, 2 samples of mustard-seed meal, 3 samples of malt, 4 samples of barley, and 3 samples of wheat. The loss of sulphur varied from 89 per cent to 97 per cent."

A simple method for estimating calcium in organic materials, H. Aron (*Biochem. Ztschr., 4 (1907), No. 2–3, pp. 268–270*).—In the method described organic matter is destroyed with nitric and sulphuric acid and the calcium which then exists as sulphate is precipitated with absolute alcohol and weighed. As the author points out, the method can not be thus used if barium or strontium is present.

Measurement of citral in species of lemon grass, A. Bloch (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 67, pp. 783–788*).—The author concludes from his studies that exact measurement of citral in lemon grass is not possible. Schimmel's process gives only the relative value of the essential oil. The determinations should always be made under the same conditions of time and temperature. The value taken should be the average of 4 to 6 tests, and a margin of from 2 to 3 per cent is allowable in averaging the results obtained.

Detection of citric acid, G. Favrel (*Bul. Soc. Sci. Nancy, 3. ser., 8 (1907), No. 2, pp. 240, 241*).—The method described is based upon the decomposition of citric acid by concentrated sulphuric acid.

Detection of hydrogen peroxid in milk, E. Feder (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 4, pp. 234–236*).—When a drop of weak formalin solution is added to 5 cc. of milk containing 0.10 per cent or more hydrogen peroxid, and 5 cc. of concentrated hydrochloric acid is added, a blue-violet color appears on heating at 60° for a few minutes.

Judging the purity of butter fat, H. Lührig and A. Hepner (*Pharm. Zentralhalle, 48 (1907), Nos. 51, pp. 1049–1056; 52, pp. 1067–1072*).—Cream from mixed milk from a large herd of cows was made into butter and various chemical and physical constants were determined, including those ordinarily reported, such as the Reichert-Meissl number, saponification number, iodin number, etc., and others recently suggested, as the caprylic acid value according to Dons, the baryta value according to Avé-Lallemant, and others.

Data are given for 18 samples collected during a period of feeding with beet leaves. The authors believe that the experiments were made under conditions that show the effect of the feed on the analytical constants of butter fat. The Reichert-Meissl number was not affected, but the saponification number of the fat and that of the nonvolatile fatty acids were increased. Some of the other constants were also more or less affected.

Determining the water content of butter, H. Faber (*Milchw. Zentbl., 4 (1908), No. 1, pp. 7–12*).—Various methods are described and compared.

Estimation of saccharose in bagasse, H. C. P. Geerligs (*Meded. Proefstat. Java-Suikerindus., 1908, No. 7, pp. 201–212*).—A study of methods.

The use of the Abbe refractometer for determining the dry substance of sugar solutions and raw sugar, A. E. Lange (*Ztschr. Ver. Deut. Zuckerindus., 1908, No. 626, II, pp. 177–198, figs. 4*).—A study of the conditions under which this method may be employed is reported in detail and leads to the general conclusion that it is easier to estimate the dry substance of sugar juices by means of the Abbe refractometer than by determining the Brix index or by means of a spindle or a balance, and that the results of the former method are nearer the true values than those by the latter except in the case of impure sugar solutions or raw beet juices.

Extracts from the proceedings of the Association of Official Agricultural Chemists, 1907 (*U. S. Dept. Agr., Bur. Chem. Circ. 38, pp. 14*).—This contains the reports of the committees on recommendations of referees, resolutions, amendments to the constitution, unification of terms for reporting analytical results and revision of methods, with the action taken by the association in each case, together with a list of the officers, referees, and committees for the year 1908.

METEOROLOGY—WATER.

The evaporating power of the air at the New York Botanical Garden, C. S. Gager (*Jour. N. Y. Bot. Gard., 8 (1907), No. 96, pp. 269–274, fig. 1*).—Observations from June 10 to September 23, 1907, at 3 stations differently situated in the Botanical Garden are reported. The observations were made with a special form of evaporimeter which was devised for an extended investigation on evaporation throughout the United States, of which these observations form a part. The rainfall during the period named was 9.32 in. The recorded evaporation at the station on a dry rocky knoll was only 0.85 in. less than the rainfall, at the station in low swampy ground 4.48 in. less, and at the station in the experiment garden about 50 ft. away from the second station 2.78 in. less.

The evaporimeters used consisted of "a pint fruit jar, tightly corked with a cork stopper soaked in paraffin. Through the stopper a glass tube extends from the bottom of the jar up and through a second cork, which tightly closes the opening into a porous clay thimble. The glass tube extends to the top of the thimble. For further protection against the entrance of water from without a paraffined piece of cloth was fitted tightly around the glass tube, and extended as a roof over the top of the fruit jar.

"The jar was filled with distilled water up to zero mark, and the porous thimble and the glass tube were also filled with distilled water. Each evaporimeter was sunk into the ground to the level of the top of the fruit jar. As evaporation took place from the surface of the thimble the water rose from the jar up through the glass tube, thus keeping the thimble full and lowering the surface of the water in the jar. The rate of evaporation varied with the relative humidity of the surrounding air, and the amount was measured by carefully pouring more distilled water into the jar from a graduate, until the water surface in the jar rose again to the zero mark. The amount of water necessary to accomplish this was the measure of the amount of evaporation for the given period."

Studies on the rate of evaporation at Reno, Nev., and in the Salton sink, F. H. Bigelow (*Nat. Geogr. Mag., 19 (1908), No. 1, pp. 20–28, figs. 4*).—The partial filling of Salton sink by the overflow of the Colorado River, as well as the means adopted for stopping the overflow, are described, and an account is given of preliminary observations on the physical factors involved in evaporation which were made at Reno, Nev., with a view to more intelligent planning of large-scale observations on evaporation from the Salton Sea. The general plan of the proposed observations in the latter region is briefly described.

Influence of plant cover on the temperature and humidity of the lower strata of the air, A. Luboslavski (*Met. Vyestnik, 1907, No. 1; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8 (1907), No. 4, pp. 477, 478*).—The author states that at the present time it may be considered as established that in the absence of any cover the surface of the soil undergoes wider temperature variations than the air. If the surface of the soil is covered by vegetation these temperature conditions of the soil are transferred to the surface of the plant cover.

Observations by the author and his pupils carried on since 1897 fully corroborate this view and show that the surface of a grass cover is actually the point of a sharp bend in the curves of the distribution of the temperature during the hours of sunlight as well as during the night hours when radiation is in excess. As a result of the heating and cooling of the surface of the plant cover the relative and absolute humidity are so distributed that at given hours the humidity increases to the very surface of the soil covered by plants. Over the plants the absolute as well as the relative humidity is always greater than over bare soil. At night, even when the humidity is near saturation, the temperature both over the grass and in the grass is lower than in the layers of air lying somewhat higher or lower. The author concludes, therefore, that the cooling is obviously a consequence of radiation alone and not of evaporation as some investigators think.

Distribution of the temperature in the lower layers of the air in the presence of woody plants, L. Rudovitz (*Met. Vyestnik, 1907, No. 2; abs. in Zhur.*

Opuitn. Agron. [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 4, p. 478*).—The author studied the distribution of temperature in the presence of woody plants, namely, shrubs, such as the honeysuckle, blackberry, ivy, young pines, etc. The observations were made by means of ordinary psychrometric thermometers with an apron guard for the protection of the bulbs from the sun's rays. Assman's psychrometers were also used. The results obtained show that the highest temperature in sunshine and the lowest during radiation, and hence the greatest daily fluctuations, were observed on the surface of the leaves.

Meteorological summary, 1891–1907, J. H. NORTON (*Arkansas Sta. Bul. 100, pp. 173–184, charts 2*).—This is a summary of observations on wind, temperature, and precipitation at Fayetteville, Ark., prepared with a view to giving the meteorological conditions under which the experimental work of the station is conducted. The mean annual temperature as calculated from the records is 58.17° F. The highest temperature recorded was 107°, August 3, 1896, the lowest —24°, February 12, 1899. The average number of clear days annually is 143. The annual rainfall varied during the period from 28.88 in. in 1901 to 67.48 in. in 1905, the average being 45.61 in.

Climate of Colorado, L. G. CARPENTER and R. E. TRIMBLE (*Colorado Sta. Bul. 127, pp. 12, charts 6*).—The results of 21 years' observations on temperature at Fort Collins are summarized in tables and diagrams.

Climatological report for the year 1906, G. A. LOVELAND (*Ann. Rpt. Nebr. Bd. Agr., 1906–7, pp. 353–382*).—Data for observations on pressure, temperature, precipitation, and wind during the year in different parts of Nebraska are summarized and compared with the means of previous years by the Section Director of the Weather Bureau of this Department. The average pressure for the State was 30.04 in., the mean annual temperature 49° F., and the average precipitation 26.98 in., 2.56 in. above normal.

Records of temperature and rainfall, JENNIE A. VOORHEES and G. D. MANNING (*New Jersey Stas. Rpt. 1907, pp. 89–92*).—Tables are given which show the daily and monthly precipitation at the station farm for the year ended October 31, 1907, and for each year since 1896, and the monthly maximum and minimum means of temperature at the same place since 1896. The characteristic features of the season were a late spring and a total precipitation (45.66 in.) which was slightly (1.71 in.) below the normal for the locality.

[**Meteorological observations**] (*Statis. Aarbog Danmark, 12* (*1907*), *pp. 178–180*).—Observations on temperature, pressure, precipitation, and frosts during 1906 and preceding years in different parts of Denmark are summarized.

Climatology (*Ann. Statis. Ital., 1905–1907, No. 1, pp. 13–44*).—This report gives the location and elevation of the various meteorological observatories cooperating with the central meteorological office of Italy, and contains summaries of observations (1871 to 1904) on temperature, vapor tension, relative humidity, amount and frequency of precipitation, and frequency of snow and hail.

Meteorological observations (*Statis. Yearbook* [*Natal*], *1906, pp. 26–30*).—Data relating to pressure, temperature, rainfall, cloudiness, and wind movement during 1906 and previous years are summarized for a number of places in Natal.

Report of chief, meteorological division, J. LYLE (*Dept. Agr. Orange River Colony Ann. Rpt., 3* (*1906–7*), *pp. 319–341*).—This report covers the year July, 1906, to June, 1907, and "contains the rainfall records received from 169 rainfall stations, together with pressures and mean monthly maximum and minimum temperatures from 9 second-order stations [in Orange River Colony]. There is also a table comparing the rainfall this year with the mean of other years for certain selected stations."

Probable weather in the Republic of Mexico during the meteorological year 1908, M. E. Pastrana and J. Guzmán (*Heraldo Agr., 8 (1908), No. 1, pp. 23–29*).—The probable weather during each month of the year ending November 30, 1908, is forecast by the central meteorological observatory of Mexico.

Observations on the oxygen content of different samples of water, H. Mehring (*Landw. Vers. Stat., 67 (1907), No. 5–6, pp. 465–480*).—A series of observations on the oxygen content and oxidizing capacity of water from the Oder River, reservoir water, and rainfall in Breslau under varying meteorological conditions, is reported and discussed with reference to self-purification.

Notes on the composition of the dissolved solids of the Nile, G. Burns (*Yearbook Khediv. Agr. Soc. Cairo, 1906, pp. 183–189*).—The results of a series of analyses made in 1906 of samples taken at Gizeh are compared with similar analyses of samples taken by Letheby at Boulac in 1874–75, and the data furnish a basis for comparison of dissolved solids in the flood water beginning in August with those in the low Nile water. The later analyses do not show the large fluctuations in potash and soda reported by Letheby, and disprove any claim that the flood water is especially rich in potash.

Improvement of water for domestic and industrial purposes by means of alumino-silicates or artificial zeolites, R. Gans (*Jour. Gasbeleucht., 50 (1907), pp. 1026–1029; abs. in Jour. Soc. Chem. Indus., 26 (1907), No. 23, p. 1251*).—From the results of further experiments here reported, the author concludes that iron and manganese may be completely removed from water by passing it through a filter composed of calcium-aluminum silicate, and that a hard water may be softened by filtration through sodium-aluminum silicate, the latter substance also removing any iron, manganese, and ammonia which may be present in the water. Hardness due to calcium sulphate may be removed by passing the water successively through layers consisting of strontium-aluminum silicate and calcium-aluminum silicate.

On the importance of Bacillus coli communis as an indicator of pollution of water with fecal matter, K. Saito (*Arch. Hyg., 63 (1907), No. 3, pp. 215–236; abs. in Chem. Ztg., 31 (1907), No. 101, Repert. No. 93, p. 632*).—The author reports investigations indicating the universal occurrence of this organism in water, and therefore concludes that its presence can not be taken as evidence of pollution with fecal matter.

Lawrence Experiment Station (*Municipal Jour. and Engin., 24 (1908), No. 3, pp. 69–72, figs. 3*).—This is a brief account of the work relating to water and sewage purification which has been done during the past 20 years, and of investigations now under way at this station.

It is stated that "one of the most remarkable and pointed results of the work of the station was the great reduction in the death rate of the city of Lawrence itself. This city draws its water supply from the Merrimac River, which can safely be said to be one of the worst polluted rivers in the world. It takes the sewage from a population of over 200,000 and the bacterial count often runs above 13,000 and seldom less than 1,000. Previous to 1893, Lawrence had suffered a yearly visitation of typhoid fever, which caused a very high death rate. In 1893 a water filter was constructed under the direction of the State Board of Health and following experiments carried out at the experiment station. The result of that action was to reduce the total death rate of the city 60 per cent, and the typhoid death rate 85 per cent, and it might also be said that the cost of the filter was saved in the first year in the reduction of funeral expenses.

"The conclusions that have been reached are, of course, particularly applicable to Massachusetts. About the only general statement that can be made is that, where filter material is cheap and of the right quality, sand filtration of both water and sewage is entirely feasible and perhaps the cheapest way. Local conditions always govern, and what might do in one place would possibly be wrong in another."

On the utilization of peat for the purification of sewage, A. Müntz and E. Lainé (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 2, pp. 53–58; abs. in Rev. Sci. [Paris], 5. ser., 9 (1908), No. 4, p. 123*).—The authors report results of experiments in which they utilized in the purification of sewage waters the high nitrifying power of peat.

The apparatus used consisted of a bed of fragments of peat 1.6 meters in depth. It was found that such a filter bed was able to purify in a very satisfactory manner sewage added at the rate of 4 cubic meters per square meter of surface. It was also found that after excessive additions of sewage water the purifying power of the peat bed was very quickly renewed, so that in the case of such beds there may be wide variations in the amount of sewage added without notable variation in the purification. Only a part of the ammoniacal and organic nitrogen which disappeared in these experiments was recovered in the form of nitric nitrogen. The authors conclude, therefore, that the oxidizing action is not due exclusively to nitrifying organisms.

SOILS—FERTILIZERS.

Soils, T. Dietrich, L. Frank, and M. P. Neumann (*Jahresber. Agr. Chem., 3. ser., 9 (1906), pp. 42–118*).—This section of this report reviews as usual investigations (up to the end of 1906) on rocks and minerals and their decomposition products, cultivated soils, including their analyses and properties, physics, especially absorption of soils, the lower organisms of soils, and moor soils and moor culture. A classified bibliography is given at the end of the chapter.

The distribution of solute between water and soil, F. K. Cameron and H. E. Patten (*Jour. Phys. Chem., 11 (1907), No. 8, pp. 581–593, figs. 4*).—The results obtained in studies with (1) soil, gentian violet, and water; (2) quartz flour, eosine, and water; and (3) manure extract, soil, and water, are briefly reported and discussed in this article, the following conclusions being reached:

"(1) The distribution of solute between solvent and absorbent presents, in general, the same characteristics with soils as with other absorbents.

"(2) For any series of soils or other absorbents the order of the absorptive capacities for one solute may be entirely different from the order for another solute.

"(3) The distribution of a solute between solvent and absorbent appears to be represented by the formula $C^n/C_1 = K$, where n may be less than, equal to, or greater than unity. Generally, when soils are the absorbents, the change of surface or 'flocculation' introduces a modifying factor and the form of the distribution equation becomes more complex."

Soils [of north-central Wisconsin], S. Weidman (*Wis. Geol. and Nat. Hist. Survey Bul. 16, 1907, Sci. Ser. 4, pp. 672–681*).—This is a brief general account of the soil conditions of this area which have been more fully reported upon elsewhere (E. S. R., 16, p. 27).

Soils, B. C. Aston (*New Zeal. Dept. Agr. Ann. Rpt., 15 (1907), pp. 105–110, pls. 2*).—Chemical examinations of a number of samples of soil from different parts of New Zealand are reported, and the results of tests of Murray's long-tube sedimentation process for the mechanical analysis of soils (E. S. R., 17, p. 1046) are given. The process is considered especially suited for use in schools to demonstrate the difference in mechanical composition of soils.

A shaking machine for use in connection with Dyer's method of soil analysis is described, and the need and main requirements of a general soil survey are discussed.

Investigations on chernozem (black soil) from Southwest Russia, and its plant food requirements, A. von Ugrimov (*Mitt. Landw. Inst. Leipzig, 1907, No. 8, pp. 3–67, pls. 3, figs. 3*).—This article discusses briefly theories of the origin and formation of chernozem soils, describes the physiographic features and structural characteristics of the particular soil studied in this case, and reports mechanical and chemical analyses of the soil and pot and field experiments to determine its fertilizer requirements. The methods used in the analysis of the soils, fertilizers, and plant products are briefly described.

The mechanical analyses reported show from 52 to 63 per cent of material removed by elutriation and no particles larger than 2 to 3 mm. diameter. Notwithstanding the fact that the soil was very fine-grained, it had a granular structure very favorable to percolation and similar processes.

The chemical analysis of the soil showed potash 0.2 per cent, lime 0.57 per cent, nitrogen 0.23 per cent, and phosphoric acid 0.03 per cent, indicating that the soil is especially poor in phosphoric acid. Examination by means of Bogdanov's method (shaking 1 kg. of soil in 4 liters of 2 per cent acetic acid for 48 hours) showed only 0.00073 per cent of phosphoric acid, indicating a great deficiency of assimilable phosphoric acid.

Pot and field experiments with wheat and analyses of the crop produced bear out the chemical analysis in indicating that phosphoric acid is the element of plant food especially needed in this soil. The field experiments indicated that superphosphate might be used at the rate of 26.7 lbs. of phosphoric acid per acre with profit.

Variations in steppe soils in different climates, F. Gessert (*Naturw. Wchnschr., 22 (1907), No. 45, pp. 705–707*).—This is a brief general discussion of the origin, formation, and characteristics of steppe soils in different parts of the world.

A distinction is drawn in this discussion between the steppe soils of tropical, subtropical, and temperate zones, but particularly between steppes of cold regions and those of warm regions. For example, those of South Sahara, consisting mainly of shifting sands deficient in humus, are compared with those of eastern Russia and Siberia, which are held in place by more or less vegetation and contain considerable amounts of humus.

The transportation of soil particles from one steppe region to another—as, for example, from the Sahara into the Chinese loess region—is explained by the variation in atmospheric pressure over the different areas, resulting in strong air currents from one to the other.

Soils [of British East Africa] (*Bul. Imp. Inst., 5 (1907), No. 3, pp. 243–246*).—Mechanical and chemical analyses of 3 samples of typical soils are reported and discussed. The soils contained a large proportion of clay and when mixed with a small quantity of water formed a stiff plastic mass. They were fairly well supplied with nitrogen and potash, but were deficient in phosphoric acid, a deficiency which is stated to be common throughout East Africa.

The conservation of soil moisture, F. F. Matenaers (*Fühling's Landw. Ztg., 56 (1907), No. 21, pp. 754–756, fig. 1*).—The cultural methods employed in the arid portion of the United States for conserving the soil moisture are described.

The productiveness of the soil, A. Grégoire (*Bul. Soc. Cent. Forest. Belg., 14 (1907), No. 7, pp. 380–397, figs. 2; Ann. Gembloux, 18 (1908), No. 1, pp. 28–43, figs. 2*).—From a review of the literature bearing on this subject the following conclusions, among others, are drawn: The productiveness of a soil is determined by the minimum factor. The soil should be so prepared as to be adapted to the root growth peculiar to the species of plants to be produced, since the growth of the plant (other things being equal) is proportional to the volume of soil traversed by the roots. A granular structure of the soil is especially necessary to root growth in forestry, this condition being dependent upon the previous vegetation. The amount of rainfall and the capacity of the soil for water are of prime importance and perhaps in the majority of cases determine the growth obtained on a soil; the conservation of the water in the soil is regulated by the nature of the litter, the physical character of the soil, the contents of humus, the depth of the surface soil, and the structure of the soil.

It is pointed out that a forest soil is in large measure the work of the forest itself and results from the reciprocal action of a large number of factors which act slowly and through long periods. Sudden changes in forest conditions should therefore be avoided, for such changes are likely to be followed by injurious consequences.

Maintenance of fertility with special reference to the Missouri loess, W. H. STEVENSON, A. H. SNYDER, and I. O. SCHAUB (*Iowa Sta. Bul. 95, pp. 31, figs. 4, dgms. 4, map 1*).—This bulletin discusses the general problems involved in the maintenance of soil fertility, gives a brief account of field experiments now in progress to test the effect of various carriers of plant food, manures, green manures, and crop rotations upon the various types of soils upon which they are located, and describes the soil of the Missouri loess area.

The Missouri loess is described as "less clayey than the other types of loess found in the State, but has all the characteristics of a wind-formed soil. . . . It is buff, or yellow, in color, and is composed of fine particles of exceedingly uniform size. Loess rarely, or never, contains large pebbles or stones, and but very little coarse sand. . . . It varies greatly in depth, being more than 100 ft. thick in some places near the Missouri River, while it has only a depth of a few feet in sections farther east.

"This type of soil withstands both drought and excessive rainfall remarkably well, and in general it may be said that it does not wash badly, considering its rolling topography. Its porous nature allows large amounts of water to pass into the soil readily. In localities where the loess is of great depth the water may pass downward beyond the reach of plant roots, and may carry away the soluble and readily available elements of plant-food from the plants.

"The porous nature of this soil permits of the free circulation of air and promotes the rapid decomposition of organic matter. . . .

"Owing to the rapid decomposition of the organic matter in the Missouri loess, infertile tracts, varying from a few acres to as much as 50 acres in extent, are being developed where the loess is deep and the topography rolling. Nearly every farm in the Missouri loess area is more or less affected in this way, and, as the number and area of these tracts tend to increase, they form a subject of much concern."

The results are given of a field experiment with fertilizers on one of the infertile hilltops of the loess area. No material benefit was derived from the application of phosphoric acid in the form of steamed bone meal or of potash in the form of sulphate. Apparently the best method of improving this soil is the adoption of a system which economically maintains an adequate supply of organic matter. "Two methods have been mentioned for accomplishing this end: First, the application of manure; and, second, crop rotation. This rotation should include the growing at frequent intervals of a crop which leaves a large percentage of its material upon the land."

Report of the soil chemist and bacteriologist, J. G. LIPMAN and P. E. BROWN (*New Jersey Stas. Rpt. 1907, pp. 141–204, pls. 3*).—This report contains accounts of inoculation experiments with Azotobacter, bacteriological studies of an unproductive soil from Madison, N. J., and studies of the effect of soil treatment on ammonification in culture solutions.

Inoculation experiments with Azotobacter (pp. 141–170).—These experiments were made in cylinders open at both ends, 4 ft. long, and sunk into the soil. Prior to 1904 the soil in these cylinders (made up of equal parts of red shale and quartz sand) had been subjected to various systems of manuring. In 1904 the soils were removed and thoroughly mixed, sampled for analysis, and returned to the cylinders. The pots then received various manurial treatments and one series was inoculated with *A. vinelandii*, another with *A. beijerincki*, and a third remained uninoculated. The first summer the soils were left bare, then a rotation of crops, including oats, corn, and rye, was grown in the pots in close succession until 1907.

The yield of dry matter and the nitrogen content of the crops were determined in every cylinder. While considerable variations were observed in different cases, it appears on the whole that inoculation with Azotobacter did not in these experiments increase the nitrogen resources of the soil, although the results do not preclude the possibility that inoculation with this organism may be made of practical value. It will be necessary, however, to determine more accurately the most suitable conditions for the growth of this organism.

Bacteriological studies of Madison soil (pp. 170–186).—This soil, although in good mechanical condition and abundantly supplied with lime and nitrogen, was apparently in an abnormal bacteriological condition, since either the seeds planted in it failed to germinate or the young plants quickly died. Plat experiments in which the effect of adding acid phosphate, muriate of potash, and carbon bisulphid was tested were made on the soil in place, and pot and culture experiments were made in the greenhouse and laboratory of the station. Oats were grown in the plat experiments and millet in the pot experiments.

The results, particularly of the pot experiments, indicate that carbon bisulphid improved the productive power of the soil. Acid phosphate was also beneficial. Muriate of potash was of no advantage, and calcium carbonate produced a small increase in yield.

The culture experiments showed that the highest yield of ammonia nitrogen was secured when the smallest amount of carbon bisulphid (2 gm. per pot) was used. Acid phosphate also stimulated the growth of the ammonifying bacteria, and the application of lime resulted in a progressive increase in ammonification.

As regards the effect of the treatments on nitrifying power, the results were irregular and inconclusive. The sum of ammonia, nitrite, and nitrate nitrogen was considerably less than the amount of ammonia nitrogen originally present in each culture, indicating either a volatilization of the ammonia from the culture solutions or its transformation into soluble organic compounds.

The soil treatments in general reduced the denitrifying power of the soils. The double quantity of carbon bisulphid (4 gm. per pot) produced a more marked effect in this respect than any other treatment. The application of lime apparently increased the denitrifying power of the soil.

A considerable fixation of atmospheric nitrogen was observed in all cases in culture solutions inoculated with the Madison soils, and this fixation was evidently influenced by the previous treatment of the soil. The double quantity of carbon bisulphid proved superior to any other treatment as a means of encouraging the activities of the Azotobacter and other nitrogen-fixing species.

"The double application of carbon bisulphid showed, two months later, the following effect on the soil:

"(1) Ammonification had evidently been retarded at first, but subsequently became more intense, not sufficiently so, however, to equal the effect of the other treatments. (2) Nitrification was more intense than in the untreated soil. (3) Denitrification was much less prominent than in the untreated soil. (4) Nitrogen fixation was markedly superior to that in the untreated soil.

"The treatment with acid phosphate led to a comparatively large increase in ammonification; a comparatively small increase in nitrification; a decrease in denitrification, and a decrease in nitrogen fixation.

"The treatment with acid phosphate and single quantity of carbon bisulphid led to a marked increase in ammonification; an increase in nitrification; a small decrease in denitrification; a decrease in nitrogen fixation.

"Muriate of potash led to a decrease in ammonification; increase in nitrification; slight decrease in denitrification; slight decrease in nitrogen fixation.

"When used in combination with the single quantity of carbon bisulphid, muriate of potash led to an increase in ammonification; increase in nitrification; decrease in denitrification; increase in nitrogen fixation.

"The lime treatment led to a pronounced gain in ammonification; a gain in nitrification; a decrease in denitrification; and an increase in nitrogen fixation."

Ammonification in culture solutions as affected by soil treatment (pp. 186–204).—The effect of applications of calcium and magnesium carbonate alone and in combination, acid phosphate, Thomas slag, bone meal, sodium nitrate, calcium nitrate, calcium cyanamid, ammonium sulphate, cyanate (a by-product in the manufacture of illuminating gas), and dried blood was studied in pot and culture experiments.

The results of the experiments with calcium and magnesium carbonates have already been reported in detail (E. S. R., 19, p. 828).

The effect of applying acid phosphate, as measured by the culture experiments, was irregular and inconclusive. Thomas slag, on the other hand, increased the production of ammonia to a considerable extent. Nitrate of soda in the larger amounts (5 gm. per pot) increased the ammonification coefficient, while ammonium sulphate depressed it. Dried blood greatly increased the ammonifying power of the soil, and calcium cyanamid at first increased and later depressed it. Cyanate was distinctly injurious to the ammonification bacteria in the soil.

In pot experiments with millet the cyanate depressed the yield of dry matter and particularly of nitrogen. Nitrification was apparently slightly stimulated by the larger applications of nitrate of soda. Ammonium sulphate also slightly favored nitrification. The effect of dried blood on nitrification was not clearly shown. The cyanamid and cyanate were unmistakably injurious to the nitrifying bacteria.

On the influence of bacteria on the conductive capacity of soils for heat, R. STIGELL (*Centbl. Bakt. [etc.], 2. Abt., 19 (1907), No. 16–18, pp. 499–502*).—Observations on soils inoculated with cultures of *Bacillus subtilis*, *B. coli communis*, *B. mesentericus fuscus*, and *Proteus vulgaris*, and subjected to alternating higher and lower temperatures, are reported. While the differences in temperature conditions of inoculated and uninoculated soil similarly treated were small, the conclusion was reached that bacteria, at least under the most favorable conditions for development, retard the conduction of heat in soils and thereby reduce the temperature changes due to variations in the outside temperature.

The nitrogen cycle and soil organisms, S. F. Ashby (*West Indian Bul., 8 (1907), No. 1, pp. 94–102; Hawaii. Planters' Mo., 26 (1907), No. 12, pp. 478–486*).—This is a summary of present knowledge on nitrogen fixation, breaking down of nitrogenous matter, nitrification, and denitrification.

Experiments with Nitragin, C. Macías (*Com. Par. Agr. [Mexico], Circ. 67, pp. 4, pls. 5*).—This is a brief report of successful experiments on alfalfa with a pure culture prepared and distributed by the Commission of Agricultural Parasitology of Mexico.

The power of sodium nitrate and calcium carbonate to decrease toxicity in conjunction with plants growing in solution cultures, O. Schreiner and H. S. Reed (*Jour. Amer. Chem. Soc., 30 (1908), No. 1, pp. 85–97, pl. 1*).—This paper reports the results of a study of the action of living plants upon solutions of toxic organic compounds (vanillin, cumarin, arbutin, etc.) with and without the addition of sodium nitrate, calcium carbonate, and other substances. (See also E. S. R., 19, p. 822.)

The authors conclude from the results obtained in water cultures with wheat plantlets that "the activities of the plant roots are able to decrease the toxicity of organic compounds to a certain extent, provided the original concentration of the solution is below that able to cause death of the plants. It is probable that the oxidizing power of the root plays a greater or less part in the process of amelioration. The first set of plants may have absorbed directly some of the toxic material from the solutions, but the greatly diminished toxicity of the solutions as well as the formation of dyestuffs indicated that other changes had taken place.

"The addition of certain inorganic salts to solutions of toxic organic compounds was distinctly beneficial to plant growth. That the inorganic salts and the physiological activities of the plant working together had accomplished the destruction of toxic substances was shown by both plant growth and chemical tests."

Experiments with fertilizers, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 112, pp. 55–86, pls. 9*).—This bulletin summarizes experiments on the station farm during the past 8 years. The results of the first 6 years' experiments have also been summarized in a previous bulletin (E. S. R., 18, p. 20).

The results show in general that the soil upon which the experiments are being made "is very deficient in available phosphoric acid, and that as soon as this deficiency is supplied then there is a lack of nitrogen and to a less extent of potash also."

"If leguminous crops are raised and either plowed under or fed on the farm and the resulting manure carefully saved and applied to the soil it is very probable that in practice it will be necessary to purchase only phosphoric acid in order to increase the productiveness of soils of this type and to maintain them in a condition of high fertility.

"Stable manure has demonstrated again its great value as a restorer of fertility to a poor worn out soil."

Demonstration experiments with fertilizers during the year 1906 in the Province of Göritz-Gradiska, A. Devarda (*Ztschr. Landw. Versuchsw. Osterr., 10 (1907), No. 10, pp. 725–749; abs. in Chem. Zentbl., 1907, II, No. 23, p. 1865*).—The experiments of which these were a continuation were begun in 1900. From the 204 cooperators who undertook the experiments only 88 complete reports were obtained, 75 for experiments on grass lands and 13 for experiments on clover soils. The principal constituents of the fertilizers used were 40 per cent potash salt and 14 per cent superphosphate. The season was very unfavorable and the rate of assimilation of the potash and phosphoric acid of the fertilizers was very variable. The results show in general the profitableness of commercial fertilizers for the production of forage plants. Beyond this the experiments yielded very few positive practical results.

Agricultural experiments with ashes which fell during the eruption of Vesuvius in April, 1906, L. Bernardini (*Staz. Sper. Agr. Ital., 40 (1907), No. 4-5, pp. 310-320; abs. in Chem. Zentbl., 1907, II, No. 21, p. 1756*).—Analyses of these ashes collected at different places in the vicinity of Vesuvius show on the basis of dry matter 9.05 to 10.25 per cent of potash, 2.81 to 3.36 per cent of soda, 8.21 to 9.42 per cent of lime, 0.54 to 0.64 per cent of phosphoric acid soluble in hydrochloric acid, and 0.21 to 0.47 per cent of chlorin soluble in water.

Culture experiments with the ash under varying conditions showed that there was a sufficient amount of sodium chlorid in the ash to be injurious to plants, but that this was soon removed by rain. The ash was in the form of an almost impalpable powder.

Utilization of pond mud (*Jour. Bd. Agr. [London], 14 (1907), No. 8, pp. 495-497*).—Analyses of samples of pond mud from different sources are reported and the experience in the use of this material at the Kew Gardens and elsewhere is briefly summarized. The beneficial effect of pond mud on light, dry soils is attributed as much to its physical effect as to its chemical action and content of plant food.

On fertilizer experiments with lime nitrogen, nitrogen lime, and lime niter, Steglich (*Fühling's Landw. Ztg., 56 (1907), No. 22, pp. 769-781, figs. 2*).—The results of 5 years' experiments with a number of different crops grown in pots are summarized and show that the relative efficiency of the different manures, taking that of nitrate of soda as 100, was as follows: Green manures 81, ammonium sulphate 95, lime nitrogen 96, nitrogen lime 94, and basic calcium nitrate 101.

On the manurial effect of calcium cyanamid under different conditions, S. Uchiyama (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 93-104, pl. 1*).—Pot experiments with barley and *Brassica chinensis* indicate that "the manurial effect of lime nitrogen varies greatly with the reaction of the other manuring compounds. It acts best when the total reaction in the soil approaches neutrality. The manurial effect of ammonium sulphate also varies greatly with the reaction of the other manuring compounds. It acts better when sodium phosphate than when superphosphate is applied along with it." It must therefore be inferred that ammonium sulphate also acts best when the reaction of the total manure approaches neutrality.

Under favorable conditions the manurial effect of lime nitrogen was equal to that of ammonium sulphate, but when the nitrogenous manures were compared in small applications ammonium sulphate proved superior. "This result may be due to the changed state of the reaction. On sandy soil the action of lime nitrogen was farther below that of ammonium sulphate than on loamy soil."

Cultural experiments relating to the solubility in citric acid and the fineness of phosphatic slag, C. Schreiber (*Bul. Agr. [Brussels], 23 (1907), No. 10, pp. 769-782; Rev. Gen. Agron., n. ser., 2 (1907), Nos. 11, pp. 433-437; 12, pp. 481-490*).—Ten slags, varying in solubility in citric acid and in fineness of grinding, were compared in pot experiments on oats and white mustard.

In the first series of experiments the slags were applied (1) in quantities furnishing equal amounts of total phosphoric acid, and (2) in quantities furnishing equal amounts of phosphoric acid soluble in 2 per cent citric acid. The soil used was a river alluvium (loam) poor in phosphoric acid.

In the second series of experiments the efficiency of the slag as purchased, of the fine portion passing a sieve having meshes 0.17 mm. in diameter, of the coarse portion which did not pass the sieve, and of the insoluble residue left after treatment according to the Wagner method was compared on loam and sandy soils.

The efficiency of the slags varied widely when applied on the basis of equal amounts of total phosphoric acid, but these differences were greatly reduced when equal amounts of citric-acid soluble phosphoric acid were applied. White mustard utilized the less soluble slags to a greater extent than oats, but in both cases the fineness of the slag was the most important factor in determining the utilization of the phosphoric acid.

In the case of oats, and to a less extent with mustard, the degree of fineness greatly influenced the efficiency, especially on loam soils. The insoluble residue from the treatment with Wagner's reagent was much more effective than the coarse portion of the slag in case of some slags, but almost without effect in others. In sandy soils the fineness of the slag was of much less importance than in clay soils and the insoluble portion was more effective. The addition of bicalcium phosphate increased the coefficient of utilization of the insoluble residue of the slag. The results indicate that the citric-acid soluble part of the coarse portion is less efficient than that of the fine portion and thus that all the phosphoric acid dissolved by the citric acid is not directly absorbable by plants.

Recent observations on leucite and its application as a fertilizer, U. Alvisi and D. Venditori (*Gaz. Chim. Ital., 37 (1907), II, No. 4, pp. 379–383; abs. in Chem. Zentbl., 1908, I, No. 3, p. 286*).—The mineralogical character of leucite is explained and its applications, especially its use as a fertilizer in Italy, are referred to. Experiments to determine whether the potash of leucite or leucitite would be rendered more available by treatment with superphosphate in solution or with orthophosphoric acid gave negative results. The authors conclude that sulphuric acid as well as carbon dioxid and water often plays an important rôle in the kaolinization of these substances.

The use of feldspathic rocks as fertilizers, A. S. Cushman (*Chem. News, 96 (1907), Nos. 2500, pp. 205–207; 2501, pp. 218, 219; 2502, pp. 226–230; 2503, pp. 238–240*).—Reprinted from Bulletin 104 of the Bureau of Plant Industry of this Department (E. S. R., 19, p. 322).

On the influence of solubility on availability, G. Daikuhara (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 87–91*).—From the results of experiments with barley the author concludes "that in the presence of lime as carbonate, the necessary amount of magnesia applied in the form of crystallized sulphate for barley in sand culture is so small that the best ratio of lime to magnesia becomes 60 : 1, while in the form of nitrates of calcium and magnesium in water culture the best ratio for Gramineæ is between 1 : 1 and 2 : 1. This conclusion will hold good also for various sandy soils, while for clayey soils the best ratio . . . will differ. The calculation from the above results shows that with barley 4.9 parts $MgSO_4.7H_2O$ are agronomically equivalent to 100 parts magnesite, while with rice this equivalent is still higher, viz., 9.8."

On the most favorable ratio of lime to magnesia for the mulberry tree, M. Nakamura (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 129–133, pl. 1*).—From the results of pot experiments here reported the conclusion is drawn that for the mulberry tree the best ratio of lime to magnesia is 3 : 1.

On manuring with magnesium sulphate, G. Daikuhara (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 81–86, pl. 1*).—Pot experiments with barley are reported which indicate that "the cheapest and the most effective magnesium compound for the regulation of the lime factor in a soil very rich in lime is the crystallized sulphate. The most effective method of application of the magnesium sulphate is top-dressing, repeated annually in small doses." On the loamy humus soil used in these experiments 10 parts of this salt was as effective as 100 parts of the finest powdered magnesite, when applied before sowing and mixed with the whole soil, while in the form of top-dressing 1 part of the sulphate had the same effect as 100 parts of magnesite.

The stimulating effect of manganese salts on crops, II. VON FEILITZEN (*Jour. Landw., 55* (*1907*), *No. 4, pp. 289-292; abs. in Chem. Zentbl., 1908, I, No. 3, p. 287*).—Experiments are briefly reported in which an application of 10 kg. per hectare (11.2 lbs. per acre) of manganese sulphate produced no increase of grain or straw in case of oats grown on raw upland moor land.

Sodium chlorid as a fertilizer for beets, H. BRIEM (*Deut. Landw. Presse, 34* (*1907*), *No. 96, pp. 752, 753*).—Experiments by Damseaux, Pfeiffer, and others, which indicated that under certain conditions sodium chlorid may give as good results as potash salts, are briefly noted.

Are soils containing less than 0.02 per cent SO_3 benefited by special manuring with sulphates? G. DAIKUHARA (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1* (*1907*), *No. 2, pp. 135-143*).—The pot experiments with three soils reported in this article indicated that even less than 0.02 per cent of sulphuric acid (SO_3) was quite sufficient to meet the requirements of barley plants for sulphur.

A review of modern fertilizer production, T. WAAGE (*Saaten, Dünger u. Futtermarkt, 1907, Nos. 45, pp. 1281-1288, figs. 13; 46, pp. 1289-1296, figs. 16; 47, pp. 1297-1304, figs. 17; 48, pp. 1305-1312, figs. 18; 49, pp. 1313-1319, figs. 12*).—The present status of the guano, nitrate, phosphate, and potash industries, and of the manufacture of phosphatic slags, and of nitrogen compounds from the air, is reviewed in this profusely illustrated article, which is an address delivered before the recent convention of German fertilizers and feeding stuffs manufacturers and dealers held in Berlin.

Fertilizers, T. DIETRICH ET AL. (*Jahresbr. Agr. Chem., 3. ser., 9* (*1906*), *pp. 118-189*).—This is the usual review of investigations (up to the end of 1906) on composition, preservation, etc., of fertilizers, methods and results of fertilizer control, and fertilizer experiments. An extensive classified bibliography is given at the end of the chapter.

The manufacture of fertilizers in American slaughterhouses (*Chem. Ztg., 31* (*1907*), *No. 90, pp. 1119, 1120*).—Brief accounts are given of the preparation of tankage, dried blood, steamed bone, azotin, and hoof meal, and of the use of these materials in the preparation of complete fertilizers. The last census is quoted to show that the production of slaughterhouse fertilizers in 1900 amounted to 160,962 tons valued at $3,326,119, and it is pointed out that the production has greatly increased since that date.

Soil amendments and commercial fertilizers (*Statis. Belg. Recense. Agr., 1906, Partie Analyt., pp. 38, 39; Partie Doc., pp. 112-129*).—Statistics of consumption of different fertilizing materials throughout Belgium are given in detail. The total consumption of various fertilizers in Belgium during 1906 was 707,580 tons.

Commercial nitrogen, R. McMURTRIE (*Amer. Fert., 27* (*1907*), *No. 6, pp. 11-15*).—The production, processes of manufacture, and future supply of nitrogen from various sources, including Chilean nitrate, ammonium sulphate, slaughterhouse by-products, cotton-seed meal, garbage tankage, and miscellaneous materials, are briefly discussed.

"It is conclusively evident that with the rate at which the demand for nitrogen compounds is increasing, the question of future supply is a serious one. While there is no narrow limit on the quantity of ammonium sulphate that could be produced in the United States, due to the fact that in over 90 per cent of coal coked to-day the ammoniates are wasted, there is a limit to by-products of the abattoirs. The major part of available nitrogen for agricultural purposes will undoubtedly be derived from various by-products and by the aid of the new electrical processes."

Fixation of atmospheric nitrogen, T. Schloesing, Jr. (*Rev. Sci.* [*Paris*], *5. ser., 8 (1907), No. 10, pp. 289–297; Engrais, 22 (1907), Nos. 46, pp. 1097–1101; 49, pp. 1171–1175; 50, pp. 1195, 1196; abs. in Sci. Amer. Sup., 65 (1908), No. 1685, p. 247*).—The present status of the nitrogen question is reviewed with special reference to new sources of supply opened up by the inventions and discoveries of Birkeland and Eyde, Frank and Caro, Müntz and Lainé, and others. The author uses these inventions and discoveries as illustrations of the great advantage of a combination of advanced scientific work and industrial practice.

The utilization of nitrogen of the air in agriculture, P. Ulrich (*Schr. Phys. Ökonom. Gesell. Konigsb., 47 (1906), pp. 266–270*).—This is a brief review of recent progress in the investigation of means of utilizing the nitrogen of the air through the agency of nitrogen-fixing organisms in the soil, and the manufacture of lime nitrogen and calcium nitrate.

On the formation of nitrogen oxid in high-tension flames, F. Haber and A. Koenig (*Ztschr. Elektrochem., 13 (1907), No. 46, pp. 725–743, figs. 4; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 121, pp. 69, 70*).—This article deals with various theoretical considerations and reports observations on the effect of the character of electrodes, pressure, and strength of current on the process of oxidation. As a result of these investigations the authors now recommend colder arcs for the fixation of nitrogen.

The combustion of nitrogen in the arc between conductors of the second class, E. Rasch (*Ztschr. Elektrochem., 13 (1907), No. 41, pp. 669–674, figs. 3; abs. in Chem. Zentbl., 1907, II, No. 20, p. 1682; Sci. Abs., Sect. A—Phys., 10 (1907), No. 119, pp. 643, 644*).—This paper discusses the work of Le Blanc, Clement, Nernst, and others (E. S. R., 18, p. 535), and describes the apparatus used and the results obtained by the author in 1905 in a study of the process of oxidation of atmospheric nitrogen with the electric flame passing from a metallic oxid electrode directly into the condensing solution (water) of the system, showing that in this case the nitrogen drawn in through the tube containing the oxid electrode passed into the form of nitric acid or nitrates in the condensing solution without observable formation of nitrogen oxids. There were also produced some uncondensable white vapors which were thought to be ammonium nitrate or possibly a new nitrogen compound.

The utilization of the water power of the Alz in the manufacture of nitrates (*Saaten, Dünger u. Futtermarkt, 1907, No. 46, pp. 1358–1363*).—This project, for which about 39,500 horsepower is available, is described, with preliminary notes on the importance of nitrates for German agriculture and industry and the present status of their manufacture.

Developed phosphate deposits of northern Arkansas (*Amer. Fert., 27 (1907), No. 6, pp. 5–10*).—This is a brief review of the geographic distribution, geology, and development of these phosphate beds taken mainly from reports which have already been noted (E. S. R., 10, p. 337; 14, p. 430).

Phosphates for Europe, A. W. THACKARA (*Mo. Consular and Trade Rpts.* [*U. S.*], *1907, No. 327, pp. 147–149*).—Statistics are given of the amount and price of fertilizing materials imported by Germany. It is stated that "Germany imported in 1906 27,385 tons of artificial guano, poudrette, etc., 29,157 tons of natural guano, 37,823 tons of bone meal, 193,896 tons of Thomas phosphate meal, 531,195 tons of phosphates, 78,036 tons of superphosphate, and 20,687 tons of animal blood, manure, etc." Of the total amount (531,195 metric tons valued at $7,443,926) of phosphates imported by Germany 293,119 metric tons valued at $4,111,450 was supplied by the United States. By far the larger proportion of the imports from this country consist of mineral phosphates, particularly Florida phosphate.

Fertilizer inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 153, pp. 85–108*).—This bulletin reports the results of analyses of manufacturers' samples of fertilizers licensed to February 10, 1908. The bulletin also contains a general discussion of the subject of fertility and plant food and explanations regarding certain fertilizers sold in Aroostook County since 1906 which have fallen short of the guarantied composition.

Fertilizers, C. S. CATHCART (*New Jersey Stas. Rpt. 1907, pp. 21–27*).—A brief summary is given of the results of fertilizer inspection during 1907, the details having already been reported in bulletins of the station (E. S. R., 19, pp. 526, 829). A table gives wholesale prices of the essential elements of plant food for 1906 in New York City.

During the year 666 samples of fertilizing materials were examined. Of the complete fertilizers 180 brands contained nitrogen in form of nitrates, 213 nitrogen in form of ammonia salts, and 83 nitrogen in both of these forms. There were 264 failures to reach the guaranty, representing 215 brands, 40 brands being deficient in 2 and 4 brands in all 3 ingredients. The number of deficiencies was 20.1 per cent of those possible. The average composition of the fertilizers examined was total nitrogen 2.3 per cent, available phosphoric acid 7.45 per cent, and potash 5.86 per cent. The average valuation was $22.35 per ton and the average selling price $28.31.

Complete report on commercial fertilizers for 1907, J. H. STEWART and B. H. HITE (*West Virginia Sta. Bul. 114, pp. 135–198*).—This report gives the results of examinations of 196 samples of fertilizers examined during the year, with a discussion of the quality of the fertilizers sold in the State. It includes a strong protest against the low grade of many of the fertilizing materials offered for sale in the State.

Laws regulating the sale of commercial fertilizers in Massachusetts (*Massachusetts Sta. Circ. 18, pp. 4*).—This circular gives the text of the State fertilizer law enacted in 1896, with an amendment, enacted in 1907, requiring the publication of dealers' prices and valuation, together with regulations and instructions adopted by the experiment station for the enforcement of the law.

AGRICULTURAL BOTANY.

Evaporation and plant development, B. E. LIVINGSTON (*Plant World, 10 (1907), No. 12, pp. 269–276, fig. 1*).—This is an abstract of a paper presented by the author before the Conference on Acclimatization in New York in October, 1907. It gives a description of experiments carried on to determine the effect of evaporation as a climatic factor.

The experiments were conducted in soil that was kept nearly at its optimum moisture and the plants used were garden nasturtiums, morning glories, marigolds, sunflowers, mustard, castor bean, muskmelon, teasel, and jimson weed. The seeds were sown in May, and from that time the drought conditions increased until into July, when the summer rains set in.

With the exception of the castor bean and muskmelon, which developed normally from the first, all the plants ceased to grow after the development of a few leaves, and they remained in this state until the coming of the rainy season. With the advent of the rainy season all the plants responded in a marked manner, except the nasturtiums and teasel, which succumbed to the evaporation in spite of the change in seasons.

This is believed to indicate that the castor bean and melon were able to absorb and transmit water to their foliage faster than it was lost by transpiration, and hence were able to carry on vigorous growth even during intense drought. The nasturtiums and teasel failed to provide the excess of water needed for growth even in the rainy season, and consequently perished.

This experiment seems to indicate that, so far as the behavior of native desert plants is concerned, the evaporating power of the air is an important factor in controlling desert vegetation, aside from its indirect influence through the conditions of soil moisture.

The author figures and describes a simple device for measuring evaporation.

Evaporation and plant habitats, B. E. Livingston (*Plant World, 11 (1908), No. 1, pp. 1-9*).—In continuation of previous observations (see above) the author calls attention to the fact that the evaporating power of the air appears to play an important part in the determination of vegetation which can best succeed in different but neighboring habitats of the same region.

The experiments described were carried on in the vicinity of Tucson at 4 different elevations, and comparisons are drawn with the humidity and sunshine in other regions, from which it appears that the evaporating power of the air furnishes a valuable criterion for the comparison of the conditions of plant habitats, and it must be considered as being a controlling factor in the determination of the plants occurring in any locality.

The physiology of gum formation in the Amygdalaceæ, W. Ruhland (*Ber. Deut. Bot. Gesell., 25 (1907), No. 6, pp. 302-315, figs. 3*).—The author discusses the various theories regarding the physiology of the gum formation in plants belonging to the stone fruits, particularly with reference to the gummosis of those plants.

The influence of grafting on plants containing hydrocyanic acid, L. Guignard (*Ann. Sci. Nat. Bot., 9. ser., 6 (1907), No. 5-6, pp. 261-305, figs. 9; Rev. Vit., 29 (1908), Nos. 735, pp. 61-68; 736, pp. 89-92; 738, pp. 145-152, figs. 5; 739, pp. 173-176, fig. 1; 740, pp. 201-206, figs. 3; 741, pp. 229-231; abs. in Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 27, pp. 1376-1380*).—After reviewing the published accounts of investigations by a number of authors on the transfer of alkaloids and other substances through the grafting of plants, the author describes a series of experiments in which he grafted herbaceous and perennial plants, using on common beans varieties of *Phaseolus lunatus* that were rich in cyanogenetic glucosids, and species of Photinia and Cotoneaster, which were grafted upon quinces and hawthorns.

The author found that whenever a plant containing cyanogenetic glucosids is grafted upon one in which they are absent, or vice versa, there is no transfer of the glucosid from graft to stock or from stock to graft. Among the Rosaceæ which seem to possess the ability of forming these glucosids, the substances will be transferred from stock to graft if the species are nearly related and contain the same kind of glucosid; otherwise in the artificial symbiosis which is established by grafting each species will retain its chemical properties.

The toxic effect of certain common salts of the soil on plants, Florence N. Magowan (*Bot. Gaz., 45 (1908), No. 1, pp. 45-49, fig. 1*).—The author claims that previous investigations in testing the toxic effect of salts on plants have either been made to test the limit of endurance or the highest concentration at which plants could live in pure salt solutions, or the experiments have been carried on for so short a period as to be considered inconclusive.

In her investigations wheat of the variety Early Genesee was selected, and for comparison radish and clover seeds were used and found to give results similar to those described for wheat. In all the experiments the seeds were supported on filter paper, so that they might germinate in the solution from the beginning, and equimolecular solutions were used of calcium, potassium, sodium, and magnesium, as these salts are the ones commonly found in the soil. Control experiments with tap and distilled water were carried on with each series, and the plants made a better growth in distilled water than in any of the salt solutions, showing that they were all toxic rather than stimulating in the concentrations used.

The order of germination is recorded, in which it is shown that seeds in potassium chlorid and sodium chlorid were the first to send out roots and for several days remained in advance of those in calcium chlorid and magnesium chlorid, but that after 15 days those in magnesium chlorid were dead, while those in calcium chlorid were still living. In all the solutions the limit of growth was reached in about 30 days.

The results of the investigations show that the principal soil bases are toxic. The following is the order of toxicity of their chlorids, beginning with the most poisonous: Magnesium chlorid, sodium chlorid, potassium chlorid, and calcium chlorid. Further, experiments lasting but a short time, such as have been reported by most investigators, can not be considered as conclusive as longer experiments. After 6 days plants in sodium chlorid and potassium chlorid made more growth than in calcium chlorid, while after 25 or 30 days the plants in calcium chlorid were considerably in advance of all the others.

The action of manganese on plants, G. SALOMONE (*Staz. Sper. Agr. Ital., 40 (1907), No. 2, pp. 97-117*).—A study was made under field conditions to determine the influence of a number of compounds of manganese on the growth and development of maize, oats, onions, and meadow grass.

In a second series of experiments with one dozen species of economic plants and several cryptogams, the author sought to determine the form in which manganese is found in plants. The manganese salts were found to stimulate the formation of the nitrogenous contents of the plants, the sulphate, nitrate, and binoxid of manganese giving the greatest increase. Manganese was found in many instances in the plant stored as a waste product, while in others it was in such intimate organic combination as not to be readily recognized by the ordinary reagents employed.

The malignant effect of certain trees upon surrounding plants, H. S. REED (*Plant World, 10 (1907), No. 12, pp. 279-282, fig. 1*).—The author describes the growth of coleus under a Kentucky coffee tree in the grounds of this Department, in which the plants close to the tree were less vigorous than those at some distance. It is held that the conditions of plant growth, such as water, plant nutrients, and light, were not such as could fully account for the harmful effects noted upon the surrounding vegetation. The most deleterious effects seemed to be due to organic substances washed from the bark of the tree by rain and left in the soil. Deleterious substances may also be excreted from the roots of trees and, in certain cases, exert an injurious effect on surrounding plants.

The antitoxic value of complete and incomplete nutrient solutions, A. LE RENARD (*Essai sur la Valeur Antitoxique de l'Aliment Complet et Incomplet. Thesis, Univ. Paris, 1907, pp. 213, dgm. 1*).—The author has studied the action of a large number of chemical substances in overcoming the toxic effect of the soluble salts of copper on *Penicillium glaucum.* The copper salts employed in his experiments were the acetate, chlorid, nitrate, and sulphate.

After a historical review of the subject the author discusses the biology and physiology of the fungus, the physiological rôle of various elements in a complete nutrient solution, and the toxic action of various substances, and describes his experiments with isolated mineral salts, organic compounds of various kinds, etc.

Among the results obtained, it was found that inorganic salts and the various sugars experimented with had no inhibiting effect when used alone. Organic salts or bases combined with organic salts were decidedly corrective in their action. The ability of preventing the poisonous action of copper salts, according to the author, depends upon the simultaneous occurrence in the solution of the proper carbon compound and inorganic salt in combination with the proper organic or inorganic acid. The author discusses the results of his experiments at considerable length.

The chemistry of some of the higher fungi, J. Zellner (*Chemie der höheren Pilze. Leipsic, 1907, pp. VI+257*).—A monographic study is given of the chemistry of some of the higher fungi, mostly species of Basidiomycetes. Chapters are devoted to the ash content, carbohydrates, fats, lecithin, acid bodies, bases, tannin, coloring matter, proteids, toxins, ferments, etc.

The author states that the body of the fungi consists mainly of chitin or the related fungin. True cellulose or lignin is never found, chlorophyll and starch are absent, and the carbohydrates are dextrin-like. The protein substances are more or less soluble. The basic bodies are abundant, and true alkaloids are never found. Coloring matter and ferments are quite generally distributed throughout.

The fermenting power of pure yeasts and some associated fungi, W. B. Alwood (*U. S. Dept. Agr., Bur. Chem. Bul. 111, pp. 28, figs. 4*).—On account of the increased use of pure yeast cultures in certain industries, a study has been made of a number of yeasts from native and foreign sources to determine their power in fermenting apple juice. The methods for testing pure yeasts are described at considerable length, after which detailed accounts are given of the fermenting power of a number of pure and mixed cultures.

A bibliography of mycological literature, G. Lindau and P. Sydow (*Thesaurus litteraturæ mycologicæ et lichenologicæ ratione habita præcipue omnium quæ adhuc scripta sunt de mycologia applicata. Leipsic, 1907, vol. 1, pt. 1, pp. 400*).—Lists are given, arranged in alphabetical order by authors, of the mycological and lichenological literature relating particularly to plant diseases, fermentation, forestry, agriculture, medicine, etc. Bacteriological literature, except as related to plant diseases, will not be included. The authors expect to issue 3 volumes in 2 parts each, and the present part includes 7,575 titles and contains the works of authors as far as Eaton. The additional volumes and a supplement are expected to be issued during the present year and the work completed in 1909. The titles, as far as possible, are taken from original publications, but where these have not been available, from the list known as Scientific Papers.

FIELD CROPS.

Demonstration work in cooperation with southern farmers, S. A. Knapp (*U. S. Dept. Agr., Farmers' Bul. 319, pp. 22*).—This bulletin describes the demonstration work as carried on by the Bureau of Plant Industry of this Department and points out that this includes the demonstration of improved methods of agriculture in the weevil-infested districts and the extension of the same principles to other southern States beyond the range of weevil infestation. The territory covered by the first of these divisions includes eastern and northern Texas, southern Arkansas, Oklahoma, Louisiana, and a portion of Mississippi, the total area being more than 300,000 square miles. The second division, or the extension of the principles to States yet free from weevil infestation, was commenced in Mississippi in 1906, and in cooperation with the General Education Board of New York was extended in a limited way in 1907 to Alabama, Virginia, North Carolina, South Carolina, and Georgia. As at present organized there will be employed during the ensuing year in the cooperative demonstration work 59 agents paid from government appropriations and in the extension work 84 agents paid by the General Education Board. About 12,000 demonstration farms had been established up to February 1, 1908, and 20,000 farmers had agreed to cooperate and make reports as to results. It is pointed out that at least 360,000 persons visit these demonstration farms during the year.

The instructions given to farmers are discussed and the means of influencing them to adopt better methods are described. The cultural system for producing cotton under boll-weevil conditions is outlined in detail, the demonstration work on various farms in connection with corn culture and the growing of soil renovating crops is noted, and the practical results accomplished are presented in condensed form.

West Virginia agricultural resources and possibilities, J. B. GARVIN (*Charleston, W. Va.: State Bd. Agr., 1907, pp. 163, pls. 43, maps 6*).—This publication, published by authority of the West Virginia State Board of Agriculture, discusses the topography, soils and crops, live-stock industry, fruit-growing possibilities, educational advantages, and market facilities of the State.

Contributions to the knowledge of agriculture and agricultural conditions in Syria, H. AUHAGEN (*Ber. Land. u. Forstw. Auslande, 1907, No. 16, pp. 85, figs. 48*).—The geography, climate, soil, and water of the country are discussed, and agriculture and agricultural conditions are described. The natural flora and fauna of importance to agriculture and the economic conditions of the Bedouins and Fellahs are considered. Notes are also given on irrigation and animal husbandry as practiced in the country.

Report of the agronomist for the season of 1907, A. E. GRANTHAM (*Delaware Sta. Bul. 81, pp. 20, figs. 4*).—The experiments here described were begun in 1907, and the report is therefore confined to the work of that season.

Of 48 varieties and strains of corn grown the 10 earliest maturing sorts were Clarage, Funk 90-day, Reid Yellow Dent, Leaming, King of the Earlies, Early Butler, Wood Northern Dent, Riley Favorite, Iowa Silvermine, and Pride of the North. Of these, Iowa Silvermine stood first in yield with 68 bu., and Early Butler last with 30 bu. per acre. The average yield for the 10 earliest varieties was 50 bu. per acre. The average for the 10 latest maturing varieties was 73 bu., for the 10 highest yielding sorts 78 bu., and for the 10 lowest yielding varieties 35 bu. per acre. The best yielding variety in the entire list was Eureka, which produced 96 bu. per acre. In an ear-row test the yields ranged from 25.7 to 71.7 bu. per acre.

Of 37 varieties of cowpeas compared, New Era, Whippoorwill, Warren New Hybrid, and Early Booleck were the leading varieties in seed production, yielding 15.6, 13.2, 12.3, and 10.7 bu. per acre, respectively. New Era, Whippoorwill, Clay, Red Crowder, and Iron made the best growth, held the leaves well, and were least subject to blight.

Thirteen varieties of soy beans grown for hay varied in time of maturity from August 28 to September 21. No. 12399, Early Green, Medium Early, and Early Brown yielded 5 tons and over per acre. Only four varieties failed to make 4 tons per acre, and each of these made about 3 tons. In a seed test 21 varieties were grown and the range of yield was from 9 bu. of seed for Early Green to 32.1 bu. for No. 19186. Seven varieties produced 20 bu. or over and only two fell below 12 bu.

Brief notes are given on the yield of miscellaneous forage crops, including millets, rape, buckwheat, Kafir corn, and sorghum. The results of top-dressing meadows with commercial fertilizers show the greatest profits from the use of 160 lbs. of nitrate of soda, 320 lbs. of acid phosphate, and 80 lbs. of muriate of potash per acre. Practically the same profits were secured from the use of 240 lbs. of nitrate of soda and 320 lbs. of acid phosphate per acre as from the use of 320 lbs. of nitrate of soda, 320 lbs. of acid phosphate, and 80 lbs. of muriate of potash per acre.

Results of cooperative tests of varieties of corn, wheat, oats, soy beans, and cowpeas, 1907, A. T. Wiancko and C. O. Cromer (*Indiana Sta. Bul. 124, pp. 25–60*).—The work here reported is in continuation of experiments previously noted and described (E. S. R., 18, p. 925). This year the experiments were conducted on about 650 different farms throughout the State and included 678 tests of 4 to 5 varieties each. There were 415 tests of 4 to 5 varieties of corn, 75 of 5 varieties of winter wheat, 55 of 5 varieties of oats, 62 of 4 varieties of soy beans, and 71 tests of 4 varieties of cowpeas. The results secured by the different experimenters are shown in tables.

The backwardness of the season seriously affected the results of the experiments in many cases and much immature corn was reported. In sections 1 and 2 the average of the reports showed the order of maturity to be as follows: Early Yellow Dent, Cook Yellow Dent, Dunn Yellow Dent, and Anson White Dent, the difference between the first and last being about 10 days. In sections 3 and 4 of the State, Early Yellow Dent was fully 2 weeks earlier than the three other varieties with which it was compared. In section 5 Golden Dent ripened first, being followed by Riley Favorite, Reid Yellow Dent, Leaming, and Boone County White, all varieties ripening within a period of about 10 days. In section 6 Reid Yellow Dent was the earliest, and in section 7 Golden Dent, Reid Yellow Dent, Leaming, Boone County White, and Pride of Indiana ripened in the order mentioned, Golden Dent ripening about 3 weeks earlier than Pride of Indiana. In section 8 the yellow varieties apparently were only 4 or 5 days ahead of the white. In sections 9, 11, and 12 the order of maturity was practically the same, the rank being Golden Standard, Johnson County Yellow, Pride of Indiana, Johnson County White, and Vogler White Dent, the difference between the first and the last being a little over a week. In section 10 Reid Yellow Dent ripened first, being followed by Golden Standard, Pride of Indiana, Johnson County White, and Vogler White Dent, the first ripening about 2 weeks earlier than the last.

The results of tests with winter wheat varieties showed that Michigan Amber was a little superior in yield. Dawson, Golden Chaff, Abundance, New American Banner, Mealy, and Rudy have also given good results.

The experiments with oats showed that Great Dakota, Silver Mine, and Czar of Russia are quite similar in appearance and habits of growth. National and Swedish Select have a plumper grain and are better than average yielders. Early Champion was found to be a week or 10 days earlier than the other varieties.

The yields of varieties of soy beans showed important differences. Dwarf Early Yellow, Ito San, and Early Brown, which are very similar in their general characteristics, ripened from September 10 to 15, or about 115 days from planting. No. 12399 ripened in about 130 days and was found to be a good yielder both in grain and forage. Medium Early Yellow matured in about 150 days and usually requires severe frost to ripen it, the frost, however, doing little harm to the quality of the seed.

The tests with cowpeas were made to determine the relative yields of total dry matter of forage and hay. Nearly all varieties gave profitable yields of forage, but in seed production they varied considerably. In the order of maturity their range was as follows: Early Blackeye, Michigan Favorite, Whippoorwill, New Era, Iron, and Clay. All of these may be cut for hay about September 1.

Forage crop experiments, G. A. BILLINGS (*New Jersey Stas. Rpt. 1907, pp. 55–79, pls. 19*).—A number of crops were grown for soiling purposes, and the acreage, date of planting and cutting, and yield are reported in tables, together with brief notes on each crop. A total of 232.9 tons of green fodder, or an average of 7.15 tons per acre, supplied forage for 38 adult and 12 young dairy animals from May 11 to October 23, a period of 166 days. Figures are given showing that the average cost of production per ton in the field was $1.46 and the average cost for cutting and hauling about 50 cts., making each ton cost at the feeding yard $1.96. It is stated that the total nutrients in 232.9 tons of soiling crops will furnish about the same amount of food nutrients as those contained in 49 tons of clover hay or 36 tons of bran.

Rye was held back by the cold spring, later maturing very rapidly and making the feeding period rather short. Wheat on land which had an application of manure in the early summer followed by a crop of cowpeas yielded 11.1 tons of fodder per acre, while a crop on an earlier planted field without manure produced about 6 tons per acre. Ninety-day Burt, Swedish, and White Spring oats were sown with Canada peas. The Swedish oats was very leafy but apparently later than the White Spring, and the Burt was very satisfactory for early forage. Thoroughbred white flint corn planted May 15 produced 12.6 tons of green fodder per acre, with a large proportion of mature ears, while later plantings in June after rye produced but little more than half a crop.

Owing to a late spring it was impossible to harvest three crops from any field. Cowpeas have generally been followed by winter rye or wheat, which is used for early soiling or green manure the next season. Several fields were not devoted strictly to soiling rotations. On a 1-acre plat 11.1 tons of wheat and 9.7 tons of cowpeas were produced and the field was seeded to rye early in September. One plant yielded 6.7 tons of rye fodder and 8.3 tons of millet, or 15 tons of soiling crops. The plats producing wheat followed by corn gave a total yield of 13.6 tons of forage per acre.

An acre was devoted to small plat experiments with soiling crops in 1906. All crops were planted in drills 2½ ft. apart and cultivated. Cowpeas were planted June 16, and the sorghum, millets and other cereal plats June 21. Sorghum produced heads 70 days from planting and when cut 10 days later yielded 17.2 tons per acre. The yield of sorghum and Red Ripper cowpeas was at the rate of 14.4 tons, and Kafir corn and cowpeas 10.5 tons. A yield of 14.3 tons green fodder per acre was secured from Barnyard millet. Hungarian millet produced only 3 tons of green forage and German millet 5.5 tons per acre. Pearl millet gave a yield of 12 tons, Teosinte 9 tons, Yellow Milo maize 12.4 tons, and Brown Durra 10.2 tons per acre.

Brief field notes are given on 11 varieties of cowpeas compared. In yield of green forage Iron and Red Ripper ranked first, with 8.6 tons and 8.5 tons per acre, respectively. In yield of seed per acre, Michigan Favorite ranked first with 18 bu.

Alfalfa on a 2-acre plat, which had been used for several years as a feeding yard for cattle and which received as a preparation for the crop 1½ tons per acre of freshly slaked lime, 100 lbs. of ground bone, 250 lbs. of acid phosphate, and 100 lbs. of muriate of potash per acre, gave a total yield of 12.50 tons of hay. This yield was secured the first year after planting and exceeds any record made on the college farm. The expense of fitting the soil, the cost of seed and of fertilizers including lime, and the outlay for harvesting made a total cost of $5.54 per ton of hay. A dressing of 150 lbs. of acid phosphate and 50 lbs. of muriate of potash per acre given in September resulted in a vigorous growth for winter protection. Disking alfalfa in spring and summer has not been found very successful, but disking after September 1, when very few new weeds start, has given good results. A comparison of alfalfa seed from different sources resulted in the best crop from Utah-grown seed, followed by seed secured from Wyoming, Kansas, and Arizona.

Four acres of timothy and clover gave for the first crop a yield of 4.1 tons of hay per acre. The income from the field after deducting the cost of seeding and harvesting was $236.98. A second cutting made in September yielded 10.4 tons of fodder, or 2.3 tons of rowen hay, thus making a total for the season of 4.7 tons of hay per acre. On a 2-acre plat of oats and peas 2.99 tons of hay were secured per acre and the cost per ton was $7.32.

A 4-year rotation experiment was begun to determine whether the loss of soluble plant food and surface washing can not be prevented by growing cover crops while at the same time the fertility of the soil is increased. The first year all plats in the series were planted with Gold Standard Leaming corn. Two plats received cover crops, one being sown with rye and the other with crimson clover. The results of the first year showed that of the plats receiving a cover crop the smallest yield was secured on the plat growing rye and the highest yield on the plat growing crimson clover. Exactly the same minimum and maximum yields, however, were secured on two of the check plats.

The results of a fertilizer rotation experiment seemed to show a little advantage from the application of raw phosphates, but as the results are only of one year's work no definite conclusion is drawn. A fertilizer test with silage corn indicated that basic slag as a source of phosphoric acid produced very satisfactory yields.

The cost of growing and cutting corn, and filling the silos, as determined at the station shows that the total expense of producing silage per ton amounted to $3.50.

The method of making hay caps and their use in curing alfalfa hay is described, and the good results secured are pointed out.

Experiments with different crops, K. MALKOFF (*Ghod. Otchet. Drzhav. Zeml. Opitna Stantz. Sadovo* [*Jahresber. Staatl. Landw. Vers. Stat. Sadovo*], *4* (*1906*), *pp. IV+146, pls. 8*).—The leading varieties of cereals and their average yields per hectare for 3 or 4 years at the experiment station of Sadovo were as follows: Common red domestic and Noë winter wheats each 3,070 kg., Petkus rye 3,550 kg., native 6-rowed winter barley 3,860 kg., Columbus oats 2,430 kg., a native variety of corn 2,490 kg., a native variety of rice 4,130 kg. rough rice, Early Rose potatoes 2,128 kg., and olive-shaped fodder beet 46,160 kg.

Native and Turkestan cotton gave heavier yields than Texas cotton, but in length of fiber the American variety led the other sorts.

Alfalfa as a crop for Massachusetts, W. P. BROOKS (*Massachusetts Sta. Bul. 120, pp. 44–47, figs. 2*).—A brief general discussion is given on the efforts of growing alfalfa in Massachusetts. It is stated that although until recently the results have in all cases been quite discouraging, the station has at present three small areas of alfalfa from 1 to 3 years of age which all gave excellent crops in 1907. Pot experiments conducted at the station have brought out clearly the importance of liming the soil for alfalfa culture, and the results of tests of seeding at different dates have led to the conclusion that the best time of sowing the seed in that section is from about June 10 to 20.

General directions for the culture of the crop are given, and on land not already rich the use of 1,000 to 1,200 lbs. of basic slag meal, 300 to 350 lbs. of high-grade sulphate of potash, and 75 to 100 lbs. of nitrate of soda in addition to a heavy dressing of manure is recommended as part of the soil preparation.

Corn growing in Oklahoma, L. A. MOORHOUSE (*Oklahoma Sta. Circ. Inform. 10, pp. 7*).—General directions for corn culture are given, the methods used in Oklahoma are described, and means of improving corn by selection are suggested.

Corn culture, M. V. CALVIN and J. M. KIMBROUGH (*Georgia Sta. Bul. 78, pp. 111-124*).—Fourteen varieties of corn under test produced an average of 25.17 bu. of shelled corn per acre. The three leading varieties and their yields of shelled corn per acre were as follows: Stone Flint 30.13 bu., Cocke Prolific 29.77 bu., Marlboro 28.92 bu. It is pointed out that the varieties subjected to seed selection at this station have moved upward in rank of production.

Fertilizer experiments carried on with cotton meal and cotton seed showed that the yields of cotton and corn were largely increased as the result of using these substances as sources of plant food.

Corn was grown according to the Williamson and the Gilmore methods, the yield per acre under the Williamson method being 46.95 bu. of shelled corn, and under the Gilmore method 35.59 bu. A description of both of these methods is given.

A variety test of corn, in cooperation with this Department, is also reported. The average results for 5 years show that Marlboro ranked first, with an average yield of 39.49 bu., McMackin Gourd Seed second with 38.27 bu., and Cocke Prolific third with 36.17 bu. per acre.

The Williamson plan in 1907, C. L. NEWMAN (*South Carolina Sta. Bul. 135, pp. 21, figs. 9*).—A series of experiments are reported in which the Williamson plan of growing corn was compared with the usual method.

The results secured on 19 different plats, of which 6 were check tests, were apparently in favor of the ordinary method. The largest yield in this series, 27 bu. 50 lbs., was secured on a plat treated according to the Williamson plan and receiving 450 lbs. cotton-seed meal in place of the nitrate of soda in the general application on the Williamson plan plats, which consisted of 300 lbs. each of cotton-seed meal and acid phosphate, 600 lbs. of kainit, and 225 lbs. of nitrate of soda per acre.

Marlboro Prolific, Fry Improved, Clemson College, and Hickory King were compared by the two methods. The average yield of all varieties by the Williamson plan was 11.9 bu. and by the ordinary method 18.5 bu. per acre.

The average weight of 100 stalks grown according to the ordinary method was 77.6 lbs. as compared with 40.6 lbs for the Williamson method.

In another series the yield secured by the Williamson plan of corn culture with 1,425 lbs. of fertilizer and the ordinary method with 400 lbs. of fertilizer per acre shows that while the increase in fertilizer used on the Williamson plan plats was 255 per cent, the increase in grain produced was only 37.5 per cent. A comparison of the two methods on worn-out soils with the use of 900 lbs. of fertilizer per acre gave 10.3 bu. per acre by the Williamson plan and 14.8 bu. by the ordinary culture, and where no fertilizer was used the yields were 4.7 bu. and 4.9 bu., respectively.

At the Coast Land Station at Charleston 69.5 bu. per acre was secured by the Williamson method and 40.5 bu. by the usual method. The Williamson plan plats contained 4½ times as many stalks to the acre as the plats grown by the usual method, but the increase in yield amounted to only 46.9 per cent. The usual method plat produced a bushel of corn on 61.25 stalks and the Williamson plan plat a bushel on 158.5 stalks.

Corn breeding in Alabama, E. M. WILCOX (*Alabama Col. Sta. Bul. 142, pp. 24, pls. 7*).—The importance and value of corn breeding, the methods to be employed, and the most important practical results secured are discussed.

The average yield of Mosby Prolific obtained in breeding experiments by the station in 1905, as compared with the average yield secured in the same line of work in 1907, shows an increase in yield during this period of 19.6 per cent. Seed of this variety taken from the breeding plat of 1906 and grown by five different farmers in three localities varied in yield from 30 to 97.75 bu. per acre.

Suggestions for using the score card, testing the vitality of seed corn, and arranging the breeding and multiplying plats are given. The bulletin concludes with a list of publications on corn breeding.

Cotton culture, M. V. CALVIN and J. M. KIMBROUGH (*Georgia Sta. Bul. 79, pp. 125–140*).—In 1907 26 varieties were under test and of these Cleveland Big Boll, Layton Improved, Russell Big Boll, and Triumph headed the list in the production of seed cotton with 1,659, 1,534, 1,534, and 1,505 lbs. per acre, respectively. Layton Improved stood first in lint production with 656 lbs. per acre, followed by Cleveland Big Boll with 642 lbs. The largest bolls, 50 making 1 lb. of seed cotton, were produced by Triumph and Hart Improved. In several of the small-bolled varieties over 100 bolls were required for 1 lb. of seed cotton. Basing the rank on the yield at first picking of 400 lbs. or more of cotton, Triumph took first place with 435 lbs., followed by Cleveland Big Boll with 426 lbs., and Cook Improved with 405 lbs. Cleveland Big Boll yielded 697.80 lbs. of cotton at the second picking, while Schley, which stood second, yielded 580.20 lbs.

In one fertilizer test cotton-seed meal was the variant and acid phosphate applied at the rate of 360 lbs. and muriate of potash at the rate of 27 lbs. per acre the constants. The cotton-seed meal was applied at the rates of 180, 210, 244, 285, and 333 lbs. per acre, the use of 180 lbs. proving the most economical. In an experiment in which acid phosphate and cotton-seed meal were the constants and potash the variant, being applied at the rates of 27, 36, 48, 63, and 84 lbs. per acre, the best yields were secured from the use of 48 lbs. of muriate of potash per acre in the application. Where acid phosphate and cotton-seed meal were the constants and potash the decreasing variant the best yield of seed cotton per acre was secured with the largest quantity of muriate of potash, 27.30 lbs. per acre. The results of a fourth experiment with constantly increasing quantities of fertilizer from 200 to 600 lbs. per acre showed that 600 lbs. of high-grade fertilizer was more economical than smaller quantities.

Cotton culture, L. A. MOORHOUSE and J. F. NICHOLSON (*Oklahoma Sta. Bul. 77, pp. 33–53*).—A general discussion on cotton culture in Oklahoma is presented and the results of growing cotton in a rotation at the station are reported. The rotation in question is arranged as follows: First year, castor beans; second year, Kafir corn; third year, cotton; fourth year, oats; fifth year, wheat and soy beans. Two of the plats on which this work was conducted received barnyard manure at varying intervals, while the remaining plats received no manure whatever. In 1902, when cotton was grown, there was a difference of 102 lbs. of seed cotton in favor of the manured plat, and 5 years later, in 1907, a difference of 53.5 lbs. The manured plats had received an application of 16 tons per acre early in February, 1902, but no manure or fertilizer had been applied since that date.

The results of variety tests with cotton during the past 6 years at the station are reported in tables, and brief comments on each year's work are given.

These results show that no variety is better adapted for all parts of the State than the well-known varieties. Attention is called to the fact that every cotton field contains individual plants having desirable characteristics and that these should be selected to increase productiveness. The characteristics to be sought after in selecting cotton are given as follows: Productiveness, quality of lint, length of fiber, earliness, and storm resistance.

Cowpeas, H. T. NIELSEN (*U. S. Dept. Agr., Farmers' Bul. 318, pp. 34, figs. 8*).—This bulletin discusses the culture of cowpeas for hay, for pasture, for seed, and for soil improvement. The practice of growing the crop with sorghum, corn, Johnson grass, millet, and soy beans is described, the value of cowpea hay, seed, and straw is pointed out, and particular attention is given to the manner of harvesting the seed by machinery. Brief notes are given on 9 of the most important varieties. The results of several experiments with cowpeas conducted at the experiment stations are briefly reviewed in the text.

Oats, M. L. BOWMAN and L. C. BURNETT (*Iowa Sta. Bul. 96, pp. 23*).—Statistics on oat production in Iowa are given and the results of experiments with reference to variety, seed preparation, and seeding are reported.

In 1906, which was a favorable oat season, the percentage of hull in 15 varieties of oats ranged from 25 to 36, while in 1907, an unfavorable season, the range for these same varieties was from 34 to 50 per cent.

Of the different varieties grown at the station since 1898, only 6 have been continued through the last 5 years and of these only one, Silvermine, is considered as a leading variety of the State. The average yield of these varieties for the years 1898 to 1902 was as follows: Early Champion 51.6 bu., Siberian 49.7 bu., Green Mountain 49.6 bu., Joanette 49 bu., Silvermine 46.8 bu., and White Russian 40 bu. per acre. Later experiments have shown that Kherson and Silvermine may be considered of equal value from the standpoint of yield. Kherson ripens in from 90 to 95 days; that is, from 5 to 10 days earlier than Silvermine. The average yield of all varieties at the station for the years 1905 to 1907, inclusive, was 47.7 bu. This included 20 varieties ranging from 62.5 to 26.2 bu. per acre. The results of each year's variety test are given in tables.

A farmers' cooperative experiment was conducted to determine the value of the treatment of oats for smut with formalin. The average of 80 fields shows that the treated fields had an average of 0.5 per cent of smut, while the untreated ones had an average of 5.9 per cent.

An inquiry made among farmers with reference to the preparation of the seed bed for oats showed that practically all sow oats on cornstalk ground and that 71 per cent sow on unprepared stalk ground. Nearly all harrow in the oats after seeding, while 70 per cent disk the ground after sowing. Experiments at the station resulted in most cases in the heaviest yields from the use of 12 pk. of seed per acre sown with a disk drill. The average yield in 1907 of Kherson and Silvermine, when the seed was sown with the disk drill, was 44.9 bu. per acre, as compared with 35.3 bu. when sown broadcast. The weight per bushel was also in favor of drilling.

Attention is called to the fact that Iowa raises an average of 29.5 bu. of oats per acre, and that by the use of better varieties, better quality of seed, treatment for smut, better preparation of the seed bed and drilling, this average could be substantially increased.

Results from stripping experiments, C. F. ECKART (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 25, pp. 13, figs. 2, dgms. 2*).—A comparison in the yields of stripped and unstripped canes was made and the results are briefly reported. The average yield of stripped cane was 68.01 tons and of unstripped cane 87 tons per acre, and the available sugar from the stripped cane 8.99 tons and of the unstripped cane 12.21 tons per acre. In both plant cane and rattoons the unstripped cane showed a higher percentage of sucrose in the juice and a higher coefficient of purity than the stripped cane.

Variety tests of wheat, A. N. HUME, O. D. CENTER, and L. HEGNAUER (*Illinois Sta. Bul. 121, pp. 71–92, figs. 5*).—The experiments reported were conducted under a method designed to eliminate to some extent the effects of soil difference from variety tests for any given year. This method is based essentially upon the assumption that differences in soil fertility occur gradually from plat to plat and that the yields of the several plats should be increased or decreased in proportion as the yield of the nearest standard or check plat is lower or higher than the average of all the standards. The results in this bulletin show that such calculation had no great effect upon the conclusions.

The following table shows the actual yields of the varieties grown for 4 years and the corrected returns as based on this method:

Yields of varieties of wheat tested at Urbana.

Variety.	Actual yield per acre.					Computed yield per acre.				
	1904.	1905.	1906.	1907.	Average.	1904.	1905.	1906.	1907.	Average.
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Turkey Red	32.1	30.0	46.6	45.5	38.5	34.1	30.0	44.7	45.6	38.6
Malakoff	31.4	27.7	46.4	45.5	37.7	28.1	28.0	46.6	45.5	37.1
Hungarian	18.9	29.0	36.0	42.4	31.6	20.0	26.9	37.0	42.2	31.5
Dawson Golden Chaff	16.8	25.1	36.4	47.5	31.4	17.4	26.7	34.5	47.9	31.6
Rudy	12.7	27.9	38.2	43.9	30.7	13.5	27.6	41.2	43.8	31.5
Indiana Swamp	12.8	28.7	37.0	41.6	30.0	10.5	27.6	36.9	42.8	29.5
Wheedling	15.2	25.5	40.2	38.5	29.8	12.6	26.4	42.4	38.3	29.9

Turkey Red and Malakoff, which are botanically the same, yielded on an average of 4 years 7.9 and 6.1 bu. more per acre than any other variety tested at Urbana.

The yields of wheat from soil experiment fields at Galesburg, Virginia, Bloomington, and Sibley are given to show what some of these varieties are capable of doing under other conditions than those obtaining at Urbana. It is pointed out that on plats fertilized with phosphorus in connection with nitrogen the yields of wheat in 1905 were 40.6 bu. at Galesburg, 45.2 bu. at Sibley, 50.9 bu. at Bloomington, and 36 bu. at Virginia. On the crop experiment field at DeKalb, Kharkov ranked first with an actual yield of 29.5 bu. per acre, followed by Minnesota Winter with 25.6 bu., Turkey Red with 24.3 bu., Indiana Swamp with 22.7 bu., and Malakoff with 22.1 bu. In summarizing these results, together with those secured at the Iowa Experiment Station, it is stated that Turkey Red is the most promising variety, having averaged best or among the best in all these trials.

The yields of varieties of wheat tested in southern Illinois show that Turkey Red is not so successful in that section as many other varieties. The best average varieties in yield for 6 years were Fulcaster, Harvest King, and Red Fultz, averaging 16.5, 16.1, and 1.2 bu. per acre, respectively. These experiments also show that home-grown seed wheat may be as good or better than seed brought from a distance. The results of tests at Fairfield indicated that Harvest King and Fulcaster are comparatively well adapted to the locality, and that the Russian wheats, Turkey Red and Malakoff, and the Hungarian, Theiss, are unsuited to southern Illinois conditions.

The source of seed and its influence on crop production is discussed and the results along this line secured at different experiment stations are reviewed. The authors believe that there seems to be no adequate evidence showing that the practical wheat grower can hope for any gain from changing seed wheat merely for the sake of changing, and that there is more likelihood of loss by a change than of making any practical gain.

An outline of the classification of varieties is given and descriptive notes on most of the Russian, Hungarian, and American varieties entering into these experiments are presented.

Seed separation and germination, G. E. STONE (*Massachusetts Sta. Bul. 121, pp. 14, figs. 4*).—A brief account is given of the methods used in and the advantages to be derived from the separation of seed, together with a report on the results obtained from seed separation.

The average increase in germination of heavy seeds of garden crops and millet selected by the water-separation method was 61 per cent. The difference in weight of onion seedlings grown from heavy and light seed separated by water amounted to 37.42 per cent. With the exception of carrot and tomato seed the greatest weight of seedlings was obtained from the largest seed. From a sample of onion seed separated by the air method 33 per cent of light seed was obtained, and of 200 seeds selected from this sample the heavy seed gave a germination of 92.5 per cent and the light seed of 55 per cent.

In other seed work at the station the percentage of discarded onion seed from a number of samples separated averaged 12.6 per cent, and that of 85 samples of tobacco seed 15.5 per cent. From the best tobacco seed only 2 per cent was discarded, while in the poorest sample 37 per cent was considered without value. In the case of the onion seed 1.6 per cent was discarded from the best sample and 43 per cent from the poorest.

The results of germination tests of 373 samples of seed during the past 2 years show that the average germination of onion seed was 82.5 per cent, the highest being 100 and the lowest 28 per cent.

Seed inspection, C. D. WOODS and R. L. HAMMOND (*Maine Sta. Bul. 152, pp. 49-84*).—The chief requirements of the law regulating the sale of agricultural seeds are enumerated, the conditions under which the station makes free analyses of seeds are described, the violations of the law discussed, and the application of the written guaranty is explained. Tables are given summarizing the results of examinations of samples of seeds by the station, with a list of the weeds obtained from seeds so reported upon.

The distribution of pedigree seed, J. H. SHEPPARD and O. O. CHURCHILL (*North Dakota Sta. Bul. 79, pp. 475-510, pls. 9*).—The method of seed distribution in use at the North Dakota Experiment Station is outlined, and a few of the improved strains of seed which have been or are now ready for distribution are described.

A summary is given showing that from 1898 to 1906, inclusive, 2,462.5 bu. of seed have been distributed by the station to 945 farmers. Brome grass seed amounting to 112.5 bu. was sent to 373 persons, Golden Dent corn to the amount of 111.75 bu. to 118 persons, and 550.75 bu. of Minnesota No. 163 wheat to 102 persons. These three crops were the most widely distributed.

Weeds and methods of eradication, H. L. BOLLEY (*North Dakota Sta. Bul. 80, pp. 511-574, pls. 24, figs. 5*).—This bulletin reviews the weed work of the station and reports the results of weed control by means of chemical sprays. The author discusses native and introduced weeds, the identification of weeds, the kinds of injury occasioned by them, the particular instances when they may be a benefit, the causes of weediness, weed and seed inspection laws, and the methods of holding weeds in control.

Under the subject of weed destruction or control by means of chemical sprays, the author discusses types of spraying apparatus and machines, the method of mixing sprays and their application, and the effectiveness and benefits of the work. Notes on the control or eradication of special weeds, including dandelion in lawns, conclude the bulletin.

HORTICULTURE.

Report of the horticulturist, M. A. BLAKE and JENNIE A. VOORHEES (*New Jersey Stas. Rpt. 1907, pp. 93–133, 136–138, pls. 10*).—At the college farm the long continued investigations with orchard, small fruits, and asparagus, which have been reported on from year to year (E. S. R., 19, p. 644), were dropped, as the work was practically completed. Some new lines of work, including further experiments with apples and several strawberry tests, were taken up, as well as an experiment with sterilized manure to control the mushroom maggot which is elsewhere noted (see p. 1055). The fertilizer experiments with apples, asparagus breeding, and peach experiments at High Bridge have been continued. Another experimental peach orchard of 675 trees was set out at Vineland last spring.

The experiments inaugurated in the new peach orchards at High Bridge in 1906 and at Vineland in 1907 deal largely with the determination of expense and returns under up-to-date cultural methods, and the investigation and demonstration of the best methods of fertilization, pruning, spraying, and general management, as well as the picking, shipping, and marketing of the fruit. A detailed account is given of the work under way at both orchards. The High Bridge orchard, consisting of 1,032 trees, was set out in the spring of 1906. The total cost of trees, fertilizer, labor, and setting, etc., was $185.09. The expenses of the orchard for the first season after setting, including care and the marketing of a corn crop, was $50.29, but $69.86 was received from the sale of corn and stalks, leaving a balance over cost of cultivation of $19.57. The cost per tree at the end of the first year was 16 cts., and the net cost of the orchard at the end of the first season $33.10 per acre. Considerable tabular data are given showing the amount of annual growth made on the various plats in the summer of 1906. The Vineland orchard, consisting of 675 trees, was set out last spring, truck crops being grown between the trees. The total cost for planting and management for the first season was $202.55, but $93.69 was received for the vegetables, leaving a balance of $108.86 as the cost of the orchard for the first season.

A study was made of the brown rot of peaches, which caused much injury in the State during the past season, and suggestions are given for its control. The sand cherry and Americana plum are being tried as peach stocks to control the peach borer. No borers appeared in any of the trees propagated upon the sand cherry during the spring, although they were present in the young trees propagated upon peach roots nearby. With the view of determining their commercial value, records of the yields of the trees upon these stocks are to be kept and a study is to be made with reference to growing the trees so that they will not overgrow the stock at the union and become liable to breakage.

Some further data are given relative to the trial of various preservatives on greenhouse benches (E. S. R., 19, p. 644). Of the better preservatives, the bench treated with carbolineum is now showing some decay. An application of copper sulphate followed by cement gave better results than copper sulphate alone. Coal tar preserved the wood equally as well as copper sulphate followed by cement. A solution of copper sulphate followed by whitewash appears to be the best preservative tested. Benches receiving one spraying of copper sulphate and three of plain whitewash appeared to be as well preserved as those receiving two sprayings of copper sulphate and three of whitewash. One pound of copper sulphate is sufficient for 40 ft. of board surface.

The new experiments with strawberries consist of an extensive variety test and the comparison of muriate and sulphate as sources of potash for strawberries. A similar fertilizer experiment is being conducted with apples. The economic value of a leguminous cover crop such as cowpeas is being compared with nitrogen in the form of nitrate of soda, and comparative tests will also be made of leguminous and nonleguminous cover crops. To obtain more immediate results dwarf stocks have been used instead of standards, which will permit of a study relative to the cultivation and value of dwarf apples. The varieties included in this experiment are Bismarck, Baldwin, Duchess, Gravenstein, and Jonathan, all grafted on Doucin stock.

Asparagus seed from various sources was sown in the spring of 1906, with a view to breeding a rust-proof variety. No rust has developed upon any of the plants as yet, but rust has not been severe in the State for the past few years. The importance of selecting the seed with reference to size and vigor of plant and crowns has been brought out in this work. The differences in vigor of the plants obtained from the seed from the various sources were very great. Some good plants resulted from seed selected from rusted plants, whereas seed from good plants surrounded by rusted plants generally produced small plants. Good plants were obtained in all cases from the imported seed.

Commercial melon growing, J. Troop and C. G. Woodbury (*Indiana Sta. Bul. 123, pp. 24, figs. 17*).—This bulletin contains an account of the melon-growing industry of Indiana, with suggestions based both on experimental work and on information collected in melon-growing localities relative to varieties, methods of culture and marketing, insects, and diseases and their control, and considerable general information pertaining to the industry. There are several illustrations of cultural and packing operations and a table showing the number of melons of different weights which can be loaded 4 deep in cars 34 and 36 ft. long, respectively.

The fig in Georgia, H. N. Starnes and J. F. Monroe (*Georgia Sta. Bul. 77, pp. 41-101, figs. 102*).—The first bulletin on this subject was issued about 4 years ago (E. S. R., 15, p. 968) and treated of cultural methods, inflorescence and classification, leaf types, and varieties. Part 1 of the present bulletin treats of the nomenclature and synonymy of the figs commonly grown in this country and part 2 contains data bearing on Smyrna fig culture.

With a view of obtaining more definite information relative to the identity and characteristics of the various domesticated figs, the station has aimed to collect cuttings of all listed varieties from different points in the South and from California. Numerous cuttings of French and Italian varieties and cuttings of several varieties from the Chiswick collection in England were also secured and are being grown. A list is given of this collection, showing the source of the various cuttings. The system of classification of the figs commonly grown in the South, while based on the form of the leaf as noted in the previous report, has been revised. In the present classification the leaves are placed under 2 types, the cordate type and the calcarasiate type. The latter type is again divided into 4 groups, latate, lyrate, spatulate, and lineate. These 4 groups gradually merge each into the following one through intermediate or transitional forms. The varieties are classified relative to their foliage, and descriptive notes, with illustrations in many cases, are given of the domesticated figs that have been actually tested at the station.

With the view of determining the possibility of introducing and establishing Smyrna fig culture in the South Atlantic and Gulf States plats have been established of both the Smyrna fig and the Caprifig. The domesticated and Smyrna figs and also the Caprifigs are classified and discussed relative to their inflorescense, and an account is given of the life history of the *Blastophaga grossorum* and the manner in which this insect fertilizes the Smyrna fig.

From the work at the station thus far it appears that the variety classification of the domestic fig is far from satisfactory. Many varieties received under distinct names were found to be synonymous. In some cases varieties which have been reported as inferior in other sections were found to be superior at the station, and vice versa. Although the station plats were frozen to the ground in the winter of 1906–7, the root systems were for the most part unharmed, and further studies are to be made relative to the identification of varieties. No results are reported relative to the work with the Smyrna figs, since the Caprifigs necessary for the colonization of the Blastophaga have not come into bearing.

New December pear (*Gard. Chron., 3. ser., 42 (1907), No. 1096, p. 444, fig. 1*).—A description and an illustration are given of a new pear recently exhibited at the meeting of the Royal Horticultural Society and which received the award of merit for its good quality as a winter dessert fruit. The pear, which has been named Beurré de Naghan, is described as above medium size, the largest fruits weighing ½ lb. The skin is yellowish green, but more or less covered with minute blackish spots. The flesh is white, melting, very juicy, and free from grittiness.

The relations of weather and soil conditions to the fruit industry of southeastern Alabama, F. H. Cardoza (*Alabama Tuskegee Sta. Bul. 11, pp. 14, figs. 4*).—This is a popular discussion of this subject intended to encourage farmers to pay more attention to weather and soil conditions.

The census of fruit trees on the farms (*Preuss. Statis., 1900, No. 172, III, pp. XXII+153*).—Detailed statistical data, based on the census of 1900 but issued in 1907, are given showing the number and kinds of fruit trees in the various provinces of Prussia and in Waldeck and Pyrmont. The list comprises trees grown both on fruit farms and elesewhere, such as along the roads, highways, railway embankments, dikes, etc. In the introduction an account is given of the methods of gathering and compiling the data, together with the more important deductions derived therefrom.

Report of the botanist, B. D. Halsted, E. J. Owen, and N. D. Shore (*New Jersey Stas. Rpt. 1907, pp. 257–379, pls. 27*).—The breeding and selection of truck crops, which has been conducted and reported on for several years (E. S. R., 19, p. 646), was continued as the principal work of the botanical department. The progeny of a large number of crosses of several varieties of sweet corn, tomatoes, eggplants, Lima beans, snap beans, summer squashes, winter squashes, peas, and salsify grown on the testing grounds are described and discussed. Excerpts from reports on the seed of station vegetable novelties, sent out in the spring for testing purposes, are also given. Other lines of work reported include experiments in thinning beans, attempts to graft reciprocally tomatoes with "garden huckleberry" (*Solanum nigrum*), eggplant, and other tomatoes, and self-pollination experiments with eggplants, tomatoes, Datura, and morning glories. A study was also made of the range of variation existing in the mayweed or "feted camomile" (*Anthemis cotula*).

Of the sweet-corn crosses, Golden Bantam-Premier, was the most productive. The plants are strong and the ears of good shape and fine quality. It is believed that this sort may prove suitable for the second early crop. In the Adams-Crosby cross the sweet corn has now been separated from the flinty grains of the Adams, while the plants retain much of the sturdiness of that parent together with its plump ears and many straight rows of grains. Crosses of Golden Bantam, an early yellow sweet corn, with Country Gentleman, Stowell Evergreen, and others promise to combine the desirable qualities of both parents. The ears of the Malakosby and of the Malamo sweet corn show two quite distinct shades of color, one a straw and the other a pink. The two colors do not appear on the same ear, however. Three plantings were made of seed of the pink strain of Malakosby, with the result that 89 of the ears were straw and 41 pink color, from which it appears that the two colors are not easily separated.

A field test was made with the view of determining the power flinty sweet corn has of reproducing its kind, a block of the Malamo variety having flinty grains and a similar block with grains of the ordinary type being planted. A few ears from the former plat showed the flintiness, and the ears taken from the latter plat showed the flinty or starchy kernels in great number. It appears from this test that flinty grains tend to reproduce their kind, thereby suggesting the desirability of rejecting sweet-corn ears that show starchy grains.

In the tomato work an effort has been made to produce a fruit of marketable size having a long axis and an interior made up largely of flesh with many small seed cavities. With this idea in view large apple-shaped fruits have been bred with the plum and pear types. Some promising crosses have been secured and seeds are to be offered for trial. A preliminary classification for tomatoes, based on Mendelian principles, is offered and discussed.

The blend plants of several crosses of eggplants have shown remarkable uniformity and reflect characters of both parents in the first generation. Long White upon New York Improved gave fruit satisfactory in size and color and is offered for distribution under the name of Ivory. With the hybrids between the American and Chinese species, the size of the hybrid fruit has been much enlarged by increasing the blood of the former parent. Seeds from many of the hybrid eggplants were grown and tabular statements are given showing the various qualities of the offspring, together with notes upon the calyx character of eggplants.

The work with Lima beans was chiefly a continuation of the crosses secured between the Jackson Wonder and the several white-seeded sorts. The willow-leaf types are being studied as having possibly more resistance to mildew than the ordinary sort. A new generation of the hybrids between snap beans and the "scarlet runner" show many types differing in form of vine, leaf, flower, pod, and seed. Several new kinds of squashes were grown and used extensively in breeding. Some promising types of garden peas were also secured. From the work with salsify, which has been conducted for several years, it was found that the union of two species of very uniform but widely different colors of bloom resulted in the production of a great many shades in the flowers of the hybrids, any of which appear to be easily fixed by close-pollinating in the plant having the desired shade. The classification of the commercial varieties of okra has not been sufficiently determined as yet to take up accurate breeding work .

Extracts of reports from testers of the Pak-Choi and Pe-Tsai, the two Chinese vegetables previously described (E. S. R., 18, p. 836), are given. The plants are generally reported as quick-growing and tending to run to seed. This is not the case when the seed is sown in midsummer. Pak-Choi is very frost resistant and may be valuable as a late autumn crop. It does not seem to be attacked by the ordinary enemies of Brussels sprouts and its cabbage-like allies.

Some tests were made in thinning beans. Half of the pods were removed from several plants each of the Kelsey and the station Bush Lima beans. The results show an increase of over one-third in the weight of seed for the thinned plants, as well as a larger percentage of mature seeds. This operation may prove of value in seed production. Thinning of the "hyacinth bean" (*Dolichos lablab*) within the single flower clusters showed no change from the normal.

Reciprocal grafts were made of tomato with "garden huckleberry" (*S. nigrum*), eggplant, and other tomatoes. In general the results show no variations due to the grafting. This coincides with the results secured by E. Griffon in similar attempts (E. S. R., 19, p. 37). In only one case, a fine-leaved upon a coarse-leaved tomato, was the influence of the graft noted, the leaves from the stock and scion being the same and neither so coarse nor so fine as the foliage of the original parents.

In the close-pollination experiments with eggplants, tomateos, Datura, and morning glories, the eggplants were not as a rule close-fertilized. Some marketable fruits containing no mature seeds were produced by close-fertilization. Of the close-fertilized tomato flowers 45 per cent produced fruits, usually with less seed than the cross-fertilized fruits. Within the cross the size of each fruit showed no correlation with the number of seeds or between the number of seeds and the number of cells. Both Datura and morning glories appeared to be close-fertilizable.

Notes are also given on crosses secured with ornamental plants, including crosses of varieties of snap dragon, Dolichos, marigold, and petunia, as well as the pansy-violet and field daisy-pyrethum hybrids. A study of the mayweed (*A. cotula*), emphasizes the possibility of great variation among plants of the same kind. A photograph of 65 heads of mayweed gathered by the wayside is given, illustrating nearly as many forms. A similar study was made of wild carrot. The report is accompanied with numerous plates illustrating the work under discussion.

Distribution of station strawberries and raspberries, U. P. HEDRICK and O. M. TAYLOR (*New York State Sta. Bul. 298, pp. 49–58, figs. 4*).—The station is now attempting and has made some progress in breeding work with all of the tree fruits, grapes, red raspberries, strawberries, and several kinds of vegetables. A brief outline is given of the objects held in view in carrying on this work, together with descriptions and notes on the origin of four new varieties of red raspberries and three new varieties of strawberries offered for distribution during the spring of 1908. The strawberries are the Magnus, Prolific, and Quality, and the raspberries, Louboro, Marldon, Donboro, and Marlative. The terms of distribution are also explained.

A hedge plant for dry southwestern gardens, ANITA M. MILLER (*Gard. Mag.* [*N. Y.*], *6 (1907), No. 6, p. 293, figs. 2*).—An illustrated account is given of the use of the Algerita berry (*Berberis trifoliata*) as a hedge plant at Corpus Christi, Texas. The plants were gathered from the chaparral in the neighboring region, and when grown as a hedge have proved both useful and ornamental. The Algerita berry is a dwarfish evergreen shrub of remarkable hardiness, and is said to thrive in the most sun-baked rocky soil in shade or full sunshine, but responds to good treatment and less strenuous conditions. The berries, which are of an attractive red color, are borne in great profusion and are used for making jelly. The tough spininess of the leaves render the plant especially useful as a defensive hedge.

Daffodils, A. M. KIRBY (*London, 1907, pp. 235, pl. 1, figs. 37*).—A popular work treating of the cultivation of daffodils and narcissus, both as hardy plants and for cut flowers, with descriptions of the various types and a guide to the best varieties for various forms of planting. The book concludes with a key to the daffodils prepared by W. Miller and L. Barron, including all the hybrid groups or sections and important species.

My rock garden, R. FARRER (*London, 1907, pp. XII+303, pls. 16*).—A popular work on the making of rock gardens. In chapter 1 the author discusses the various features in the construction of rock gardens. Subsequent chapters consist of a general discussion of various alpine species relative to their characteristics, treatment, and value for rock garden planting. The work is based principally on the experience of the author.

The art of landscape gardening, H. REPTON (*Boston and New York, 1907, pp. XXIII+252, pls. 22, figs. 28*).—This is the first of a series of classics in landscape architecture undertaken at the suggestion and with the cooperation of the American Society of Landscape Architects and edited by J. Nolen.

The present volume includes what are considered two of the best works of Humphry Repton, an early English landscape gardener, as follows: Sketches and Hints on Landscape Gardening, published in 1795, and Theory and Practice of Landscape Gardening, published in 1803. These have been reprinted, illustrated in modern form, and edited to serve modern conditions. The first-named work is prefaced by general remarks on landscape gardening, and succeeding chapters deal with the discussion of different characters and situations, buildings, proper situations for a house, water, large private places, formal gardening, approaches, affinity between painting and gardening, and sources of pleasure in landscape gardening. The second work is prefaced by some general observations on taste; the introduction treats of the general principles of landscape gardening, utility, scale, examples of comparative proportion, and use of the perspective, and succeeding chapters deal with the treatment of grounds, water, various forms of planting, woods, fences, vines, farms, parks, and pleasure grounds, a discussion on landscape gardening as related to painting, ancient and modern gardening, variety of situation and character, architecture and gardening, and the formation of a new place, with concluding remarks concerning color and the difficulty of comparisons between art and nature.

Several notes by the author, dealing with various phases of landscape gardening, are appended to the volume.

FORESTRY.

The relation of the Southern Appalachian Mountains to the development of water power, M. O. LEIGHTON, M. R. HALL, and R. H. BOLSTER (*U. S. Dept. Agr., Forest Serv. Circ. 144, pp. 54*).—In connection with a survey made of the Appalachian and White Mountain watersheds under the direction of the Secretary of Agriculture, the report of which has been previously noted (E. S. R., 19, p. 948) arrangements were made with the Geological Survey for a study of the water resources of the Southern Appalachian Mountains. The present circular embraces the results of that study.

The measurements and estimates on the discharge of streams and water storage facilities of the rivers of that region as related to the production of water power are based on the data accumulated at the regular measurement stations maintained by the Survey during the past 7 years as well as on that secured from a special study made in 1907. The various rivers studied were divided into sections of convenient length and of similar character, and determinations were made of the mean drainage area of each section, the minimum discharge and horsepower, and the minimum discharge and horsepower during the 6 high-water months, and estimates were made of the horsepower available from storage during periods of 3, 6, and 12 months. These data are presented in tabular form. Desirable sites for storage reservoirs were also selected and their capacities determined. The data relative to these reservoirs are here given.

According to estimates made from this work, there is a minimum of about 2,800,000 indicated horsepower developed by the rivers originating in the Southern Appalachian Mountains, of which it is estimated that at least 50 per cent is available for economic development, providing the present forests of the mountains are protected from this time on. The importance of preserving these forests is strongly pointed out.

The relation of the Southern Appalachian Mountains to inland water navigation, M. O. Leighton and A. H. Horton (*U. S. Dept. Agr., Forest Serv. Circ. 143, pp. 38*).—In this circular the results are given of a study made under the direction of the United States Geological Survey of most of the navigable rivers of the southern Appalachian region. The effect of establishing a system of reservoirs and the preservation of the forest cover upon the navigability and general value of these streams is also discussed. The rivers under consideration are divided into two general systems, those which discharge along the Atlantic coast and those which discharge into the Ohio. Topographic surveys were made in the various river basins and selections were made of suitable sites for reservoirs. The selected sites, together with the facts concerning them, are presented in tabular form and in most cases further data are given showing the estimated influence of these reservoirs in increasing the stage of the river to various heights.

As a result of this investigation the conclusion is reached that the proper improvement of many rivers may be practically and thoroughly accomplished only by the use of storage reservoirs and the retention of the forest cover. The importance of preserving the forests for the prevention of flood damage, preservation of timber resources and water power is also brought out.

The light requirement of forest trees and the methods of measuring light, E. Zederbauer (*Separate from Centbl. Gesam. Forstw., 33 (1907), No. 8–9, pp. 6, fig. 1*).—A description is given of the author's investigations along this line, together with the methods employed in determining the quality and quantity of light absorbed.

As a result of the present investigation, which included the examination of a large number of tree species, the author finds that trees exert a selective and variable absorption on the sunlight. Red rays appear to be absorbed by all species as well as blue and violet, while the indigo and orange rays appear to be strongly absorbed by such species as the fir, spruce, and beech. Red rays are absorbed to the maximum degree and green to the minimum, while blue and violet are absorbed to a somewhat less degree than red.

The author is of the opinion that the method of measuring light by the use of silver chlorid paper is unsatisfactory, since the paper affects only the chemical rays. Reference is made to the work of numerous investigators on this subject.

The forest formations of Boulder County, Colorado, R. T. Young (*Bot. Gaz., 44 (1907), No. 5, pp. 321–352, figs. 12*).—In this paper, in addition to a brief account of methods employed and a short description of the physical features of the region studied, consideration is given to the following points: Composition of the forests with reference to the controlling and most common secondary species and the relation between them, physical character of the habitat with reference to water content of the soil, temperature of air and soil, humidity, light, pressure (altitude), slope, and exposure, and the past and present extent of the forests and their present movement, including deforestation and reforestation. The work here discussed is based upon the author's investigations made in the summers of 1902 to 1905, inclusive. It is hoped that it will prove of value in throwing light on the determination of the physical conditions under which the forests exist.

Forestry and agriculture, F. Schuster (*Jahrb. Naturw., 22 (1906–7), pp. 235–250*).—This chapter reviews progress during 1906–7 in relation to the influence of forests on the ground water, moor culture, the effect of applications of straw on yield of crops, foreign forest and park trees for Europe, okra, a new vegetable, potato tops as a feeding stuff, and the influence of previous cropping on the yield of potatoes, the germination of pine seeds, the use of commercial fertilizers in forest, fruit, and vegetable culture, lime nitrogen, the agricultural importance of the crow, the rôle of light in forests, and the culture of larches.

Annual report on the literature and important happenings in the realm of forestry relative to forestry zoology, agricultural chemistry, meteorology and forest botany for the year 1906, K. WIMMENAUER (*Allg. Forst u. Jagd Ztg., 1907, Sup., pp. 100*).—This report consists of abstracts of forest literature, together with notes on important occurrences in the forest world for the year 1906. Among the subjects treated are forest sylviculture, utilization, management, valuation, and statics, the theory of forest mensuration and yields, forest administration, history, policy, statistics, news of forest unions and hunting clubs, forest zoology, botany, and soil physics.

Annual report of the forester, 1907, A. F. HAWES (*Connecticut State Sta. Rpt. 1907-8, pt. 4, pp. 211-265, pls. 6, map 1*).—In 1901 the station inaugurated a series of forest planting experiments at Windsor, some of which have been previously noted (E. S. R., 19, p. 241). Several of the earlier experiments have been discontinued and new plantings established. The various experiments, 95 in all, are described, further grouped according to species tested, and the results summarized.

An account is also given of recent plantations made throughout Connecticut by the State, water companies, educational institutions, and private individuals, together with brief accounts of old forest plantations in Connecticut and tabular data secured from sample sections of the same relative to diameter and volume measurements, number of dead and living trees per acre, and estimated values. The text concludes with normal yield tables for Scotch pine, Norway spruce, and beech taken from H. S. Grave's Forest Mensuration (E. S. R., 18, p. 340).

As a result of the experimental plantations at Windsor and elsewhere, white, Scotch, Norway, and pitch pines are recommended as the best conifers, and chestnut, red oak, and black locust as the best deciduous trees adapted for planting on sandy land. Relative to planting material it is recommended that with pines 3-year-old transplants be used when they can be procured for $5.50 per thousand or less, otherwise 2-year-old transplants or seedlings may be used satisfactorily. With chestnut, black locust, and red oak 1-year-old seedlings are recommended, although acorns may be used for red oak.

It has been found that fairly open land can be planted with 2-year-old pines with mattocks at $1.70 per thousand trees. Where plantations were seriously threatened by field and forest fires proper supervision and fire alarms furnished adequate protection. From the studies of the older plantations of white pine it is believed that with a reasonable expenditure for purchase of land and planting at least 5 per cent compound interest may be made from such investments, figuring the value of lumber at present prices.

Report of the State forester, A. AKERMAN and F. W. RANE (*Agr. of Mass. 1906, pp. 307-328*).—An outline is given of the forestry work conducted during 1906, together with a series of volume tables for white pine in Massachusetts prepared with the assistance of the Forest Service of this Department. The tables give the average volume of individual white pine trees at different diameters and heights, and have been prepared to conform with the standard units employed in measuring the contents of logs and trees in Massachusetts. A plea is made for the regulation of forest taxation, the establishment of State forest reserves, and the improvement of the forest fire protection.

Fourth annual report of the State forester of Massachusetts, F. W. RANE (*Ann. Rpt. State Forester Mass., 4 (1907), pp. 43, pls. 4*).—An outline of forest operations for 1907, including a financial statement, is given, with lists of publications issued, lectures delivered, plants and seedlings distributed, notes on the forest nursery at Amherst, seed collected, examination of woodlands and practical assistance given owners, together with a further report on the work being conducted in constructing a yield table for white pine in Massachusetts (see above). These tables are to be published later in bulletin form.

Considerable tabulated data are also given relative to the construction of a forest map of the State. The tables show the amount and percentage of forest areas to total areas, as well as the amount and percentage of wood types for the various counties, cities, and towns of Massachusetts. It is estimated that 37 per cent of the acreage of the State is in forest land. The report also includes a statement of progress made in the investigation of pine tree blight. The forester again recommends the amendment of the laws regulating forest taxation, the establishment of State forest reserves, and the improvement of forest fire protection.

Report of the forester, W. J. GREEN (*Ohio Sta. Bul. 188, pp. 41–52*).—This bulletin contains an outline of the operations of the department of forestry for the biennial period 1906–7, together with a financial statement. The principal lines of work include the making of forest surveys, measurements relative to the rate of growth of forest trees, studies of the conditions favoring growth, sylvicultural experiments at the station farm, and cooperative work with institutions and farmers. Suggestions are given relative to the future work, the establishment of State forest reserves, State encouragement of forestry, and forestry education.

Forestry suggestions, W. J. GREEN and E. SECREST (*Ohio Sta. Bul. 189, pp. 53–74, figs. 21*).—In this bulletin the value of improving and maintaining a woodlot for forestry purposes is discussed, and popular suggestions are given for the development of woodlots of different types. The text is accompanied by illustrations of the various forest problems considered.

Evergreens; their uses and culture, W. J. GREEN and W. E. BONTRAGER (*Ohio Sta. Bul. 190, pp. 75–102, figs. 18*).—In this popular bulletin the authors discuss the value of planting evergreens for ornament, as well as for the construction of wind-breaks, shelter belts, and screens. Suggestions are given relative to their use both alone and in connection with deciduous trees, shrubs, and annuals, and the methods of planting and pruning, together with descriptive notes of all the more important evergreens, including their range, general characteristics, climatic and soil requirements, and value for different forms of planting. The text is accompanied by illustrations of specimen trees.

Planting trees for profit, T. E. WILL (*World's Work, 15 (1907), No. 1, pp. 9580–9588, figs. 12*).—A brief popular illustrated account of important tree planting operations in this country, conducted by the National and State governments, railroads, and private individuals, with some estimates as to yields already secured.

Trees and cultivated plants on the sands of Gascony, P. BUFFAULT (*Rev. Agr., Vit., Hort. Illus., 1907, Nos. 68, pp. 20–25; 70, pp. 53–56; 72, pp. 84–87; 73, pp. 100–102; 82, pp. 247–250; 83, pp. 262–264; 85, pp. 292–294; 88, pp. 342–346, fig. 1*).—A brief review of the work in sand binding conducted in Gascony throughout the past century, together with more detailed information on the work conducted by the department of streams and forests since 1880, in which notes are given on the degree of success met with from the use of a large number of trees, shrubs, orchard fruits, economic plants, vegetables, and flowers.

The more important trees found to be perfectly adapted for this work include the stone pine, Lambert cypress, tamarack, and rosemary. The holm oak, black locust, box elder, Cedrela sinensis, and mulberry have also proved fairly satisfactory. Among the food and forage crops the prickly comfrey, Irish potato, and certain vegetables have given the best results. Lucern and the Jerusalem artichoke also do well.

Forest road building and the care of water in the Harz mountains, KAUTZ (*Ztschr. Forst u. Jagdw., 39 (1907), No. 10, pp. 639–658, figs. 13*).—An account is given of the laying out, construction, and protection of wood roads in the Harz mountains in northwest Germany, accompanied by plans of the road systems in that region.

"Jiquié" rubber, O'SULLIVAN-BEARE (*Diplo. and Cons. Rpts. [London], Ann. Ser., 1907, No. 3901, pp. 15, 16*).—In connection with a report on the export of rubber from the state of Bahia for the years 1904–1906, the author gives an account of a new species of rubber which has lately been discovered in that state and is locally known as "Jiquié maniçoba" and said to be a new and distinct species of Manihot. It is said to occur in large quantities and its discovery is considered of much importance both for Bahia and the rubber trade in general, inasmuch as the rubber obtained from the Jiquié maniçoba appears to be fully equal in quality to the best Para rubber. A description is given of the tree together with its latex.

The period for extracting the latex extends from August to March. The latex is said to possess the valuable property of coagulating spontaneously when exposed to the air, requiring no acid or other artificial coagulant of any kind. "It has been found from experiment that the Jiquié maniçoba tree can be made to yield its latex between the fourth and fifth years from time of first planting, but the tree yields its maximum returns from the age of 8 years onwards."

The consignment of Jiquié rubber recently classified in New York was considered equal to the best Para rubber, and brought $1.20 per pound.

The production of rubber and the rubber trade in Bahia, E. ULE (*Notizbl. K. Bot. Gartens u. Mus. Berlin, 5 (1908), No. 41a, pp. 52, pls. 3, figs. 2, map 1*).—The present account is based upon the author's travels in Bahia. Some general observations are presented relative to the country and its vegetation, the various rubber-producing plants are described, and special notes with illustrations are given of several new kinds named by the author, including Jequié maniçoba (*Manihot dichotoma*), *M. dichotoma* var. *parvifolia*, S. Francisco maniçoba (*M. heptaphylla*), and Piauhy maniçoba (*M. piauhyensis*).

Consideration is also given to the methods of harvesting rubber, yields, agricultural conditions in the country, and rubber-planting operations. The author is of the opinion that under suitable conditions the Bahia manicobas will replace the cultivation of Ceara rubber (*M. glaziovii*), and that the cultivation of *M. piauhyensis* and *M. heptaphylla* is likely to become important on dry, infertile soils, while *Hevea brasiliensis* is considered the important source of plantation rubber in the luxuriant tropical regions.

Jequié maniçoba and its allies (*Roy. Bot. Gard. Kew, Bul. Misc. Inform. 1908, No. 2, pp. 59–68, map 1*).—The information collected at Kew since the early part of 1906, relative to the botanical classification and value as rubber producers of the Manihot varieties in the state of Bahia is here given, together with extracts from the reports of D. R. O'Sullivan-Beare and E. Ule noted above.

The tapping of Assam rubber (Ficus elastica), H. H. MANN (*Agr. Jour. India, 2 (1907), No. 3, pp. 277–279*).—The author describes an improved method of tapping rubber as adopted by W. Stiefelhagen in Cachar and gives the results of some tapping experiments in which this method was used.

The tapping instrument consists of an ordinary carpenter's chisel ½ to ¾ in. wide. This is driven into the bark vertically in a series of cuts, each the width of the chisel, across the direction of the branch being tapped and with at least

½ in. space between each incision. The rows of incisions are made about 6 in. apart on the stems and branches of the tree. Strips of tea lead are secured to the stems underneath each row, by which the latex is conducted into cups. By this method of tapping about two-thirds of the latex is said to find its way into the cups, while one-third coagulates on the cuts.

In 1905–6, 8 trees planted in 1882 were tapped in this manner and gave an average of 6 lbs. of rubber per tree. The same trees were tapped in 1906–7 and the yield for individual trees varied from 2½ to 10 lbs. Four trees planted in 1889 and 1890 were tapped in a similar manner during the same years. In 1905–6 the estimated yield per tree was about 2 lbs. of rubber, and in 1906–7 the yield per individual tree varied from 1¼ to 3¼ lbs. With this method of tapping the cuts made in the previous year appeared to heal well and to be hardly noticeable, and it is thought probable that the Assam rubber trees may be tapped more frequently than by the older methods of tapping in which the bark is seriously injured.

The latex coagulating on the cuts is said to require no further treatment. That gathered from the cups is mixed with a 2 per cent solution of formalin, poured into clean bamboo troughs and covered from the direct rays of the sun. The coagulation is said to be complete within a day's time. After the strips of rubber have dried they are rolled into balls.

[Note] on a Tonquin rubber tree, Dubard and Eberhardt (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 16, pp. 631–633*).—A general and botanic description is given of a species of rubber tree recently discovered in Tonquin, which, it is said, is of large size, occurs in very dense stands in some of the provinces, and produces a high percentage of rubber which can not be distinguished commercially from the better sorts of Para rubber. This species has been named *Bleekrodea tonkinensis*, and is said to belong to the Moracees family. Its discovery is considered important, since it is the first species of rubber to be reported from Indo-China which occurs in numerous and dense stands and which produces first-class rubber.

On the latex of Ceara maniçoba, A. S. Coelho (*Bol. Agr. [São Paulo], 8. ser., 1907, No. 8, pp. 372–376*).—Notes are given on the various methods of coagulating the latex of Ceara rubber (*Manihot glaziovii*).

Distribution of rubber plants from Kew (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1907, No. 3, pp. 103–105*).—A tabulated statement is given showing the distribution from Kew of living plants of various species of rubber to different parts of the Tropics from 1873 to 1899.

DISEASES OF PLANTS.

Diseases of plants on the home grounds and elsewhere, B. D. Halsted, E. J. Owen, and N. D. Shore (*New Jersey Stas. Rpt. 1907, pp. 379–382*).—A brief account is given of plant diseases which have been noticed during the season covered by the report.

Smut was present on some of the varieties of sweet corn, particularly Malamo and Malakosby.

Attention is called to the fact that tomatoes were rather free from disease during the year. Beans suffered but little from pod spot, and the mildew of Lima beans was not at all troublesome. This is accounted for by the general practice of spraying.

Squashes were not troubled seriously with any fungus disease, but gourds were considerably infested with anthracnose. Late varieties of peas became badly mildewed before maturing, while the early sorts escaped any disease.

Udo, a salad plant introduced by this Department, was badly blighted both during the year covered by the report and the previous season. No spraying experiments were conducted with this plant. The authors note the occurrence of the late blight (*Phytophthora infestans*) on *Solanum commersonii*, although varieties of the common potato growing at a short distance showed no trace of the disease. Brief notes are given on the asparagus rust, which seems to be less prevalent than formerly, due in part at least to the introduction of resistant varieties, the leaf blight (*Glœosporium nervisequum*) of sycamore, and the stem blight of chestnut, due to *Diaporthe parasitica*, and general notes on other diseases.

Report of the station for plant pathology, G. LÜSTNER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1906, pp. 118–181, pls. 2, figs. 4, dgms. 4*).—Among the scientific investigations carried on at the station reports are given on a study of an epidemic of downy mildew of grapes, host plants of species of Peronosporiaceæ, influence of weather conditions on the occurrence of *Peronospora viticola*, means for the control of the downy mildew, effect of carbolineum on trees, a Fusarium disease of young apple trees, grape chlorosis, potato rots, etc.

The relationships of the æcidium-cup type of rust, E. W. OLIVE (*Abs. in Science, n. ser., 27 (1908), No. 684, pp. 214, 215*).—The author states that recent investigations have to a great extent solved the problem concerning the origin of the Cæoma type of rust, but the more complicated cup fructification needs further explanation.

According to the author's investigations, the æcidium-cup type of rust is derived from a deep-seated, more or less limited, mass of cells, the peridium arising as an inclosing layer, apparently in consequence of the deep-seated character of the fructification as well as from its more or less centrifugal growth. The Cæoma type, on the other hand, is more or less superficially placed and no peridium is formed. The author calls attention to a number of differences in the development and fructification of these two stages in the life history of some rusts.

The resistance of some plants to disease, G. KÖCK (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 10, pp. 759–761*).—The author reports investigations on the resistance of certain varieties of pears to the leaf fungus (*Stigmatea mespili*), listing a number of species according to their immunity or susceptibility to the fungus.

A similar account is given of investigations on varieties of tomatoes resistant to *Septoria lycopersici*. Among the varieties of tomatoes which were most resistant, some of them appearing to be almost immune, were Wonder of the Market, Up to Date, Mikado, and King Humbert; those less resistant were Magnum Bonum, Prelude, Ponderosa, President Garfield, and Alice Roosevelt; while Trophy and Ficarazzi were especially subject to attacks of the fungus.

Dry rot of corn and its causes, J. T. BARRETT (*Abs. in Science, n. ser., 27 (1908), No. 684, pp. 212, 213*).—The disease of ear corn which has been called dry rot has been found, on investigation, to be caused by several species of fungi. One of the most destructive is a species of Diplodia, probably *D. maydis*, and to this species is attributed 85 to 90 per cent of the dry rot observed during the past 2 seasons in Illinois.

When an early infection takes place this fungus causes a premature ripening and shriveling of the ear, which usually remains in an upright position with tightly clinging and dark-colored husks. Later infections produce various degrees of rot, in many cases the disease not being detected until the husk has been removed. The seasonal infections appear to be started by conidia blown from the old rotten ears and the old stalks left standing in the field.

A second form of dry rot which is not uncommon is due to a species of Fusarium. A third form, noticed for the first time the past season, is due to a sterile fungus. The infection in this case, with few exceptions, takes place at the tip of the ear and the mycelium soon develops a deep pink color. The effect on the corn is much the same as that produced by the later infections of Diplodia. Other forms of rot have been found due to other species of Fusarium, and one or two forms to species of bacteria.

The physiology of the sore shin disease of cotton and means for its control, W. L. BALLS (*Yearbook Khediv. Agr. Soc. Cairo, 1906, pp. 93–111, pls. 4, dgm. 1*).—The sore shin of cotton, due to a sterile fungus, is said to have assumed great economic importance in Egypt since the preliminary note by the author (E. S. R., 18, p. 552). The disease appears to occur locally and at times quite destructively, and soil conditions seem to be responsible to a great degree for the occurrence and distribution of the fungus. There appear to be two distinct periods of attack. The first, which occurs almost immediately after the germination of the seed, causes the greatest amount of loss. At this time the primary root is attacked and many plants fail to appear above the ground. The secondary attack comes later, is made on the hypocotyl, and is less destructive.

Bare fallow and good tilth of soil tend to reduce the percentage of loss. As the disease appears to be closely associated with the germination of the cotton seed, experiments were conducted in treating the seed, from which it was found that the disease could be checked by dressing the seed with naphthalin, using from 1½ to 3 per cent, according to soil texture. As a means for causing the naphthalin to adhere to the seed, gypsum was found satisfactory. The cost of the treatment need not exceed 25 cts. per acre, which can be more than saved by the reduction in the amount of seed required. This treatment is said to protect the plants for about 20 days after the first irrigation, and most of the damage is done during this period. As the rough condition of the soil seems to favor the disease, the author states that cotton should not be grown after late berseem. When it does follow this crop, the latter should be plowed up soon enough to permit of thorough cultivation.

Notes on the hop mildew, E. S. SALMON (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 327–332, figs. 6*).—A study is reported of the dehiscence of the perithecium of the hop mildew (*Sphærotheca humuli*), in which it is shown that it differs very materially from the dehiscence of the grass mildew (*Erysiphe graminis*).

A number of inoculation experiments were conducted in which conidia were transferred to hops from a number of host plants which bear a morphologically similar species, and vice versa. The evidence obtained indicates that the morphological species occurring on the hop will not infest a number of rosaceous species, all of which are hosts for a species which can not be distinguished by any morphological characters from the mildew occurring on the hop.

Diseases of potatoes, G. GANDARA (*Bol. Sec. Fomento [Mexico], 2. ser., 7 (1907), No. 4, I, pp. 197–203, pl. 1, fig. 1*).—The author enumerates and briefly describes a number of organisms which cause diseases of potatoes, and gives directions for the formaldehyde and corrosive sublimate treatments of seed potatoes for the prevention of the different kinds of potato scab.

The heart rot of sugar beets, C. MERLE (*Sucr. Indig. et Colon., 71 (1908), No. 4, pp. 91–97*).—An account is given of experiments for the control of the heart rot of sugar beets, due to the fungus *Phoma betæ*.

This disease is said to make its appearance usually during the dry seasons, generally during August and the first part of September. It is especially troublesome on tertiary clay soils, particularly those containing considerable quantities of silica. Unaerated subsoils and soils lacking in humidity during the hot summer season seem to offer conditions particularly suited to the development of the disease.

For its control the author recommends cultural treatments which consist of deep plowing, especially during the winter season, so as to impound as much reserve water as possible, the use of considerable amounts of wood ashes, late planting, and wide spacing with frequent cultivation.

Investigations on some fruit diseases, H. J. Eustace (*New York State Sta. Bul. 297, pp. 31–48, pls. 7*).—An account is presented of some diseases of the fruit of apples and peaches, the effect of cold storage upon the development of the diseases, and means for preventing the spread of the fungi. Notes are also given on the effect of Bordeaux mixture on apple scab.

In the experiments with apples, spores of a number of fungi were artificially inoculated upon apples and the fruit placed in storage. Among the fungi were those causing bitter rot, black rot, blue mold, brown rot, etc. Of these only the blue mold (*Penicillium glaucum*) developed and caused any decay when the fruit was kept for 2 months at a temperature of 32° F. Upon removal to warmer temperatures all the species of fungi developed and caused decay. There was some growth of the different fungi when the fruit was kept at temperatures of 35 to 56° and a number developed vigorously in temperatures of 48 to 69°.

On account of the frequent loss of peaches by brown rot, an experiment was tried to determine the effect of cold storage on the development of the fungus causing that disease. It was found that when fruit was kept at a temperature of 32° there was a small amount of decay present at the end of 2 weeks. The results of this experiment indicate that brown rot is practically checked while the fruit is in commercial cold storage, even though the fungus can enter the fruit through breaks in the epidermis.

A series of experiments was carried on to test the possibility of destroying the apple rot fungi by means of sulphur fumigation, in which the fruit was artificially inoculated with a number of fungi, and then fumigated with sulphur burned in an air-tight room. All the fungi, with the exception of the blue mold, were destroyed by this treatment.

It is believed praticable to destroy the spores of the most common decays of apples by sulphur fumes, using 1 oz. of sulphur to 25 cu. ft. of space. It was found, however, that in fumigating with sulphur when the fumes come in contact with ripe apples the commercial value of the fruit is considerably lowered through injury by the sulphur dioxid. This gas penetrates the fruit through lenticels in the epidermis and causes a bleaching of the tissues.

Experiments to test the effect of Bordeaux mixture on apple scab spots were carried on because of the difference of opinion relative to the protective effect of Bordeaux mixture upon spots already produced by the scab fungus and are briefly described. Apples bearing well defined scab spots were thoroughly sprayed with Bordeaux mixture, the fungicide being applied to these spots. After an interval of some time the spots were found to have enlarged under the covering of Bordeaux mixture.

Some fruit rot notes, F. H. Hall (*New York State Sta. Bul. 297, popular ed., pp. 7*).—A popular edition of the above bulletin.

Cedar apples and apple leaf rust, R. E. Stone (*Alabama Col. Sta. Circ. 2, pp. 11, figs. 2*).—On account of the injury caused by the apple leaf rust, the author has taken up a study of the leaf rust and the cedar apples and this circular is issued in the hope of securing cooperation throughout the State in determining the occurrence and distribution of this disease. Different species of cedar apples are described and a list given of varieites of apples that have proved more or less susceptible to apple rust on the station grounds.

Notes on Gymnosporangium macropus, F. D. HEALD (*Abs. in Science, n. ser., 27 (1908), No. 684, pp. 210, 211*).—Investigations carried on by the author with *G. macropus* have shown that 2 years are required before the cedar apples reach maturity. Young cedar apples can be found nearly a month before the rust spots on the apple leaves have matured any æcidiospores. During the past season æcidiospores were found in viable condition from July to October 22, but these spores produced no evident infection until the spring of the next year, when growth was resumed and the young cedar apples became visible.

Apple leaf spot caused by Sphæropsis malorum, W. M. SCOTT and J. B. RORER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 47–54, pls. 2*).—The leaf spot of apples has been attributed to a number of different fungi by different investigators, and in connection with a study of some of the diseases of the apple the authors have examined the subject and found that, contrary to the general belief, the leaf spot is caused by *S. malorum*.

In their investigations the authors found that a number of fungi were present in the spots, and cultural studies as well as inoculation experiments gave evidence that the black rot fungus of the fruit also attacks the leaves, causing the circular or irregular spots characterizing the leaf spot disease. In addition to *S. malorum*, *Coniothyrium pirina* occurs abundantly on the apple leaf spots, and species of Hendersonia, Coryneum, Pestalozzia, and Alternaria were observed, but are believed to be saprophytic.

In spraying experiments for the protection of apples from fungus attacks, it was found that the leaf spot was prevented whenever the trees had been thoroughly sprayed with Bordeaux mixture. Where it is desired to control the leaf spot alone, without reference to diseases of the fruit, 2 or 3 applications of weak Bordeaux mixture during the season will be found sufficient.

Some apple leaf spot fungi, C. P. HARTLEY (*Abs. in Science, n. ser., 27 (1908), No. 684, p. 212*).—The author reports having found in West Virginia 18 species of fungi that produce leaf spots on apples. The commonest of these are *Coniothyrium pirina*, *Coryneum foliicolum*, *Sphæropsis malorum*, and an undetermined species.

A stem disease of the cocoanut palm, T. PETCH (*Circs. and Agr. Jour. Roy. Bot. Gard. Ceylon, 4 (1907), No. 8, pp. 49–53, pl. 1*).—A disease of cocoanut palms which has been under observation for sometime is described. It is characterized by the exudation of a brown liquid through small cracks in the stem, the liquid forming on the surface rusty patches, which afterwards turn black. On cutting the stems through these places, the internal tissues are generally found decayed, and immediately beneath the cracks the tissues are black and surrounded by a wet brown zone, in which the rot appears to be advancing.

The progress of the disease seems to depend upon the age of the trees. On young trees the injury spreads rapidly and the trees die in 5 to 6 years, while old trees having dense woody tissues seem to be resistant. The disease does not, so far as present observations go, seem to be able to destroy old trees.

Various opinions have been advanced regarding the cause of this disease, but the author reports having observed at the advancing stage of the disease the fungus *Thielaviopsis ethaceticus*. This fungus causes the pineapple disease of sugar cane as well as a destructive disease of pineapples. In addition to this fungus, diseased tissues have shown another, *Poria ravenelæ*, but this is believed to be a saprophyte.

On account of the rapid and destructive spread of this disease among new plantations, the author recommends the cutting out and burning of the diseased tissues as soon as noticed.

The immunity of the Japanese chestnut to the bark disease, H. METCALF (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 55, 56*).—Attention is called to the rapid spread of the bark disease of chestnuts, caused by the fungus *Diaporthe parasitica* (E. S. R., 19, p. 250), and the author states that, according to his observations, all varieties and species of the genus Castanea are subject to the disease, except the Japanese varieties (*C. crenata*). The latter have been found immune to attack in the field and also resistant to inoculation experiments.

The mildew of oaks, P. Hariot (*Bul. Trimest. Soc. Mycol. France, 23* (*1907*), *No. 4, pp. 156–159*).—Young oaks, particularly *Quercus pedunculata* and *Q. sessiliflora*, are said to have shown within the past year or two severe attacks of mildew. This fungus, which formerly was rather rare in France, has become very abundant. It attacks both surfaces of the leaves, often causing their distortion. The author has investigated the various species of mildews which have been reported upon oaks and has come to the conclusion that the one in question is probably *Microsphæra alni.*

A disease of fir trees due to Fusicoccum abietinum, A. Maublanc (*Bul. Trimest. Soc. Mycol. France, 23* (*1907*), *No. 4, pp. 160–173, figs. 6*).—A detailed description is given of the disease of fir trees that has been attributed to a number of causes, but which the author claims is produced by the fungus *F. abietinum.* This fungus attacks *Abies pectinata*, but the related species do not seem to be subject to the disease. In addition to the parasite the author enumerates several species of fungi that are quite commonly found as saprophytes on the dead leaves of the fir.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Notes on the habits of mice, moles, and shrews, F. E. Brooks (*West Virginia Sta. Bul. 113, pp. 87–134, pls. 6, figs. 3*).—The abundance of mice, moles, and shrews probably far exceeds the popular notion in this matter. The observations made by the author in various parts of the State indicate that these animals are present in large numbers and may be readily caught in traps. The economic importance of mice, moles, and shrews is likened to that of birds, the mice, like the English sparrows, crows, hawks, and fruit-eating birds, being decidedly injurious, and the shrews and moles, like the insectivorous birds, beneficial.

A detailed account is given of the habits and food of the short-tailed shrew, the most common species in West Virginia. This shrew feeds almost exclusively on animal material, and observations indicate that it is of great importance in the destruction of the larvæ of chestnut weevils and other insects underground. One shrew kept in confinement ate 72 larvæ of chestnut weevils in 5 minutes. The shrews were found to have made tunnels close together in all directions underneath chestnut trees. In addition to insects the short-tailed shrew feeds upon young mice, young birds, birds' eggs, and other animal material. Brief mention is also made of the natural enemies of the shrew.

In a study of Brewer's mole no evidence was obtained that this animal feeds upon vegetable material except on the rarest occasions. One mole kept in confinement ate 66 gm. of insect food in 24 hours. The habits of the mole are briefly described.

Notes are also given on the biology of field mice. These animals cause a great amount of damage to fruit trees, gardens, potatoes, and other crops. Meadow mice kept in confinement also ate large quantities of insects and appeared to prefer them to vegetable food. An experiment with a proprietary rat virus indicated that this material was of no value. Brief mention is also made of other species of mice found in West Virginia.

Practical methods of combating field rats, C. MACÍAS (*Com. Par. Agr. [Mexico], Circ. 64, pp. 12, figs. 8*).—The damages caused by rats to various crops are briefly discussed. The remedies proposed for combating these pests include carbon bisulphid, sulphur, arsenic, phosphorus, strychnin, and rat virus.

On introduced birds, J. DRUMMOND (*Trans. and Proc. New Zeal. Inst., 39 (1906), pp. 227–252*).—A considerable number of birds have been naturalized and established in New Zealand. Most of these have come from England and have been introduced in conformity with the sentiments of many settlers who came from England. In order to study the economic relations of these birds and particularly any changes of habits which may have occurred, the author made numerous personal observations and distributed a circular letter of inquiry among a large number of farmers and others who are interested in the study of birds.

These observations indicate quite striking changes in the feeding habits of some birds after their introduction into New Zealand. Some of the species, particularly the sparrow, sky lark, and blackbird, proved quite injurious. The black swan has thrived well in New Zealand while the white swan has increased only slowly. The ring-necked pheasant appeared to be well acclimatized within a short time after its introduction and multiplied in a satisfactory manner. Recently, however, these birds are becoming scarcer.

Seventh report of the State entomologist, W. E. BRITTON (*Connecticut State Sta. Rpt. 1907–8, pt. 5, pp. 266–338+II, pls. 16, figs. 6*).—A brief statement is given of the chief entomological features for the season of 1907 together with notes on nursery inspection.

A series of experiments was carried on for the purpose of finding whether there are any gaseous substances which can advantageously replace hydrocyanic-acid gas for fumigating small lots of trees, scions, and similar material. In these experiments the author used carbon bisulphid, carbon tetrachlorid, sulphuretted hydrogen, and chlorin in comparison with hydrocyanic-acid gas. The liquids were volatilized in shallow dishes placed upon cross boards near the top of the box. In all 359 apple and peach trees were thus treated. Carbon bisulphid used at the rate of 10 fluid ounces per 100 cu. ft. killed nearly all of the scales without injuring the trees. When used at greater strength all of the scales were destroyed and a little injury was produced upon the trees. Carbon tetrachlorid used at the rate of 40 fluid ounces per 100 cu. ft. for a period of 2 hours killed some of the trees. All of the scales were killed when this substance was used at a lower strength, and it was considered a very promising insecticide. The method of generating sulphuretted hydrogen was slow and some of the trees suffered from the insecticide. The scales, however, were all killed. Chlorin gas killed all the scales, but was also very injurious to trees and was not considered a satisfactory insecticide.

A test was made of commercial miscible oils with satisfactory results. B. H. Walden studied the habits, life history, and means of combating the peach sawfly (*Pamphilius persicum*). From the experience thus far had with the peach sawfly it is recommended that the foliage be sprayed with arsenate of lead at the rate of 1½ to 3 lbs. in 40 to 50 gal. of water. In the larval and pupal stages the insects may be destroyed in the ground by carbon bisulphid.

An account is also presented of the progress in the work of controlling the gipsy moth and a copy is given of the recent State law regarding the gipsy and brown-tail moths. The life history of the brown-tail moth is briefly described. Brief notes are given on mosquito breeding conditions at Niantic and Crescent Beach, the hickory tussock moth, round-headed apple-tree borer, pine-leaf scale, willow curculio, maple borer, and other pests. An article on lead arsenate and Paris green (E. S. R., 19, p. 454) is reprinted with slight emendations.

Report of the entomologist, J. B. SMITH (*New Jersey Stas. Rpt. 1907, pp. 387–478, pls. 3, fig. 1*).—A general review is given of the entomological features of the year.

Codling moth, black peach aphis, and fall webworm were unusually injurious. San José scale caused less damage than ordinarily. It is stated that an orchardist in New Brunswick has found that trees may be rendered more resistant to San José scale by spraying with lime. This matter requires further study. An outline is given of the present condition of the experimental orchard. In a test of setting nursery trees with and without root cutting, little difference was observed as to the subsequent infestation with San José scale.

The biological and economic relations of a number of shade-tree insects are discussed including elm-leaf beetle, bagworm, gipsy moth, cotton maple scale, periodical cicada, etc. Similar notes are given on army worm, wireworms, sweet-potato flea-beetle, squash bugs, etc. A study was made of methods for controlling root maggots. Dipping plants in arsenate of lead or dry hellebore was found to be of little value. Tar-paper disks were very effective. The insects were also controlled by brushing away the surface soil from about the stems of infested plants and replacing it with fresh soil. The same results were obtained by taking up infested plants, carefully cleaning, and resetting them.

Notes are given on miscellaneous insects including rose chafer, cranberry pests, Chinese mantis, *Melanauster chinensis*, grasshoppers, etc. The author also discusses the preparation and application of lime-sulphur washes, soluble oils, home-made miscible oils, carbolic acid, and arsenate of lead, iron, lime, and barium. The use of carbolic acid was attended with variable results, in some cases quite unsatisfactory.

Report of the chief locust officer, C. M. JOHNSTON (*Dept. Agr. Orange River Colony Ann. Rpt., 3 (1906–7), pp. 273–279, pls. 2*).—Objections have been raised against the initiation of the campaign for locust destruction on the ground that it is a hopeless undertaking. Nevertheless, bonuses have been offered for the collection of grasshoppers and this method has led to satisfactory results. Similarly the benefits of arsenical baits and sprays are worthy of mention. The author recommends that arsenites be issued free to farmers who wish to cooperate in the destruction of locusts and that spray pumps may also be loaned to such men.

The spring grain aphis, W. L. ENGLISH (*Oklahoma Sta. Circ. Inform. 8, pp. 7, figs. 4*).—The essential points in the appearance and habits of *Toxoptera graminums*, or "green bug," are presented, with notes on its natural enemies. It is believed by the author that the pest will not be of much importance during the present season.

Hessian fly, W. L. ENGLISH (*Oklahoma Sta. Circ. Inform. 9, pp. 4*).—The life history, natural enemies, and means of controlling this insect are discussed.

The galls of Lipara lucens, W. WAGNER (*Verhandl. Ver. Naturw. Unterhalt. Hamburg, 13 (1905–1907), pp. 120–135, figs. 10*).—*Lipara lucens* preferably lives in galls produced in the stems of *Phragmites communis*. The life history of the insect is described and notes are given on the peculiar anatomical structure of the galls.

The cotton bollworm, L. A. MOORHOUSE and J. F. NICHOLSON (*Oklahoma Sta. Bul. 77, pp. 54–56*).—Biological and economic notes on this pest are given. The authors recommend fall and winter plowing, the selection of early and rapid maturing varieties, and the planting at about every 200 rows, about June 1, of 5 or 6 rows of corn as a trap crop, cultivating the corn thoroughly and thereby lessening the number of worms which may at a later date attack the cotton.

A fly injurious to beans, P. A. DESRUISSEAUX (*Agr. Prat. Pays Chauds, 7 (1907), No. 57, pp. 520–523, figs. 4*).—A species of Agromyza is reported as causing great damage to string and Lima beans by boring in the stem, roots, and branches. The insect is rather difficult to combat. It is suggested, however, that as soon as the beans have been harvested, the stems and roots should be at once collected and destroyed. Some benefit may also be derived from a suitable rotation of crops.

Experiments with sterilized manure to control the mushroom maggot, M. A. BLAKE and JENNIE A. VOORHEES (*New Jersey Stas. Rpt. 1907, pp. 133-136, pl. 1*).—The mushroom maggot has become such a pest in some of the mushroom cellars that many growers have been compelled to abandon the raising of mushrooms during the summer. An experiment was made in which the manure used in mushroom raising was sterilized in boxes by means of steam. The bed in which the sterilized manure was used was more uniform and moist throughout the test. It produced more than twice as many mushrooms, but they weighed less than one-half as much as those produced by unsterilized manure. The method is not considered practicable, but the unfavorable results may depend upon some unknown factor. The matter will be studied further.

Chelonia caja, R. BRUNET (*Rev. Vit., 29 (1908), No. 733, p. 5, pl. 1*).—The adult females of this species lay their eggs on grasses and various other plants, but the growing caterpillars apparently feed by preference on the buds of grapevines. The damage thus done is considerable, for the reason that the caterpillars eat only portions of each bud and are thus able to prevent the development of a large number of buds. The pest may best be controlled by handpicking the caterpillars.

Results of experiments in the control of the olive fly, CHAPELLE (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *6 (1907), No. 12, pp. 1465-1470*).—Experiments were carried on in testing a number of formulas which had been recommended by Italian investigators as effective in the control of the olive fly. The majority of the formulas used called for molasses and an arsenate with or without the addition of honey and glycerin. The results obtained were fairly satisfactory. A simple mixture of molasses and arsenate of soda in water was also shown to be effective. These treatments in combination with the proper destruction of infested olives are likely to control the pest.

Orchard spraying, O. M. MORRIS and J. F. NICHOLSON (*Oklahoma Sta. Bul. 76, pp. 32, figs. 22*).—A series of experiments was carried on for the purpose of determining the economy and effectiveness of spraying for codling moth and other insect pests. The work was done in commercial orchards, some of the trees being sprayed once, others three times, and still others five times, while unsprayed rows were left as checks. The first two sprayings were done with a hand pump, maintaining a pressure on the nozzle of from 30 to 40 lbs., and the remainder with a gasoline engine power pump with a pressure of 125 lbs. In a comparison of Paris green and arsenate of lead there appeared to be no advantage in favor of either except that the latter remained in solution longer. Bordeaux mixture was used in each spraying. The percentage of fruit free from worms was 71.6 on trees sprayed once, 79 on trees sprayed three times, and 93.4 per cent on trees sprayed five times, and the corresponding percentages of fruit free from disease were 25, 93, and 91.7 per cent. Notes are also given on the choice of apparatus and on the preparation of mixtures of Bordeaux and Paris green.

The life history of the codling moth is described in considerable detail. It appears that in Oklahoma there are two broods of this insect overlapping one another in time of appearance. A brief account is also given of plum curculio, cankerworm, bitter rot, apple scab, apple rust, apple blotch, and fly-speck disease.

Report on an exploration in Indo China relative to treatment of coffee trees infested with borers, L. BOUTAN (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 66, pp. 631–661, figs. 15*).—A thorough investigation was made of the conditions which prevail in coffee plantations in Indo China, particularly with reference to infestation with *Xylotrechus quadrupes* and the means which have been or may be adopted for the control of this pest. Of the various enemies from which coffee may suffer four are mentioned as most important in Indo China. These include *Hemileia vastatrix*, *Zeuzera coffeæ*, *Xyleborus fornicatus*, and *Xylotrechus quadrupes*. The last named insect is the most serious pest of coffee in Indo China.

Previous experiments have indicated that coffee trees may be protected to some extent from the borer by wrapping the trunks with various kinds of fabrics, with clay soil alone, or with soil mixtures to which copper sulphate is added. A further test of these methods showed that they are not reliable. An attempt was made by the author to destroy borers in coffee trees by inducing the absorption of ammonia. This remedy gave negative results. Further experiments showed that it was possible to destroy the borers inside the trunks of coffee trees by reducing the temperature of the trunks for a few minutes to 0° C. This may be accomplished by ether spray or other refrigerating remedies. Still more satisfactory results were obtained from an apparatus by means of which the trunks could be heated to a temperature of from 60 to 65° C.

The occurrence of Lymantria monacha in Galicia during the years 1891 to 1902, W. SEDLACZEK (*Jahrb. Staats u. Fondsg. Verwalt., 6 (1907), pp. 130–152*).—A historical account is given of the prevalence of the nun moth in certain parts of Galicia and of the success which attended efforts to control it. Statistical data are presented regarding the extent of its infestation of forests.

During some years the nun moth was destroyed to the extent of 75 per cent by its natural enemies, particularly Ichneumon and Tachina flies. The parasites in question were most numerous in localities in which the trees had not been bandaged with sticky substances. At times it was found necessary to apply sticky bands about all trees in an infested neighborhood. This procedure, however, is not entirely satisfactory.

The problem of the nun moth, J. FRIEDRICH (*Centbl. Gesam. Forstw., 33 (1907), No. 12, pp. 493–500*).—The author discusses the conditions under which serious outbreaks of the nun moth ordinarily occur. The collection and destruction of the eggs of this moth is recognized as an efficient means of control in so far as it is applicable, but the eggs are laid in so many different situations that it is impossible to check the multiplication of the moth effectively by this means. Better results are obtained by collecting and destroying the adult moths. It is suggested that if as much attention were given to the nun moth as to bark beetles the former would become of little economic importance.

Homemade miscible oils, C. L. PENNY (*Delaware Sta. Bul. 79, pp. 1–34, figs. 2*).—The author has already reported the results of some of his experiments in the preparation of miscible oils, especially for use in controlling scale insects (E. S. R., 18, p. 162; 19, p. 56). It has been determined that heavy oils are required in winter for destroying scale insects. Rosin oil appears to be a very valuable reagent for producing emulsion. A number of additional tests were made in the preparation of miscible oils without the addition of other insecticides. Particular attention was given to the chemical problems involved in making combined insecticides and fungicides containing miscible oil and Bordeaux mixture, copper hydroxid, copper oleate, and other forms of copper. It was found possible to make combinations of miscible oils with these copper preparations, the cheapest mixture thus obtained being a combination of miscible oil and Bordeaux. No orchard tests have been made with these combinations of copper and miscible oils, and it is, therefore, impossible to report on their efficiency as combined insecticides and fungicides.

Miscible oils: How to make them, C. L. Penny (*Pennsylvania Sta. Bul. 86, pp. 20, fig. 1*).—The author has given much attention to devising a practical method for the preparation of miscible oils by means of special soap solutions. The soap solution specially recommended by him contains 10 gal. menhaden oil, 8 gal. carbolic acid, and 15 lbs. of caustic potash. This mixture is heated to about 300° F., after which 2 gal. each of kerosene oil and water are added. A large number of insecticide formulas have been worked out by the author for winter and summer use. The one which is considered most efficient for winter application contains 3⅗ gal. of the soap solution just mentioned, 40 gal. paraffin oil, 6 gal. rosin oil, and water in sufficient quantity for the desired dilution.

Orchard tests of miscible oils, C. O. Houghton (*Delaware Sta. Bul. 79, pp. 35–40*).—In experiments conducted by the author and other investigators it was found necessary to use kerosene emulsion containing from 15 to 20 per cent kerosene in order to get satisfactory results in destroying scale insects. By means of a miscible oil properly prepared scale insects were effectively destroyed when only 10 per cent of heavy oil was present in the spray, and it is believed that a considerably smaller percentage will give good results. The most effective formula for miscible oil thus far tested calls for 9 gal. soap solution, 1¼ gal. water, 40 gal. paraffin oil, and 6 gal. rosin oil.

A treatise on the parasitology of man, P. Verdun (*Précis de Parasitologie Humaine. Paris, 1907, pp. 6+111+727, pls. 4, figs. 310*).—In this volume an account is given of the life history and economic importance of the various animal and plant parasites (exclusive of bacteria) which may affect man. The general subject of parasitism is discussed and special chapters are devoted to protozoa, worms, arthropods, and fungi.

Transactions of the society for the study of malaria (*Atti Soc. Studi Malaria, 8 (1907), pp. XI+896, pls. 8, figs. 160*).—As in previous transactions of the society in the study of malaria, detailed accounts are given of the prevalence of malaria and the methods which have been adopted for controlling it in various provinces of Italy and other parts of the world.

W. T. De Vogel presents an account of Anopheles mosquitoes in salt water (pp. 1–18). It was found that the species of Anopheles may thrive well in ordinary sea water or even after it has been evaporated so that the percentage of salt is doubled. If larvæ are maintained in water containing a still higher percentage of salt they fail to complete their metamorphosis. Larvæ which develop from eggs laid in salt water of a high concentration complete their metamorphosis in about the usual time.

Report of the mosquito work in 1907, J. B. Smith (*New Jersey Stas. Rpt. 1907, pp. 479–560, pls. 18, map 1*).—A copy is given of the New Jersey law of 1906 regarding the eradication of mosquitoes. During the year under report a large amount of work was done under public and private auspices in the drainage of swamps, filling of small water holes, and insecticide treatment of breeding places not easily drained. A detailed statement is given of the work and results obtained in various localities in New Jersey. Some progress is reported in the encouragement and introduction of minnows which feed upon mosquito larvæ.

J. A. Grossbeck gives a series of notes on the mosquitoes of the season (pp. 544–560). The salt marsh mosquitoes were the principal offenders during the year and dominated the undrained parts of the coast for several miles inland. Of the inland local mosquitoes *Culex pipiens* and *C. perturbans* were most numerous.

The A B C and X Y Z of bee culture, A. I. and E. R. Root (*Medina, Ohio, 1908, pp. 536, figs. 552*).—This book has already been noted from a previous edition (E. S. R., 15, p. 280). In the present edition the volume is considerably enlarged and the various articles relating to various aspects of bee culture have been brought down to date.

The etiology of flaccidity in silkworms, H. Nomura (*Separate from Atti Ist. Bot. Univ. Pavia, n. ser., 9 (1906), pp. 23*).—According to the investigations reported by the author the disease known as flaccidity in silkworms is due to *Bacillus alvei*. This organism has been isolated from cases of flaccidity and the characteristic symptoms of the disease have been reproduced by inoculation. Infection takes place in most cases with the food of the silkworm. *B. alvei* is pathogenic for various other insects in addition to the silkworm. The disease referred to by the author under the name flaccidity is held to be distinct from emaciation.

International catalogue of scientific literature. N—Zoology (*Internat. Cat. Sci. Lit., 5 (1907), pts. 1, pp. XI+1259; 2, pp. VIII+548*).—In the present issue the zoological literature of 1905 is included, together with a number of titles of papers published in 1901–1904 and omitted from previous issues. The author entries were not collected in one volume but are divided into sections on each branch of the general subject of zoology.

FOODS—HUMAN NUTRITION.

Chemical analysis and composition of American honeys, C. A. Browne (*U. S. Dept. Agr., Bur. Chem. Bul. 110, pp. 1–69, 89–93, pl. 1, fig. 1*).—A large number of samples of native honeys were studied to secure data regarding the composition of this class of honeys, to establish a general range for the variation in the composition of American honeys for the convenience of food chemists, and to improve, if possible, the methods of honey analysis. The sources of honey, the methods followed, and the analytical data are reported in detail, while the results of the analyses of a large number of commercial honeys are also summarized.

As regards the composition of the native honeys, when arranged in groups according to their source the results usually show a "well-defined agreement in composition between the individual honeys of each particular class. The alfalfa honeys, for example, are usually marked by a lower content in dextrin and undetermined matter, and a higher sucrose content than any of the other varieties. In fact, two of the eight alfalfa honeys analyzed exceeded 8 per cent of sucrose, the limit set by the standards committee. The relatively high purity (low content in dextrins and undetermined matter) of the alfalfa honeys was shared, but to a less degree, by other members of the Leguminosæ.

"The honeys of the Compositæ were about the average as regards organic non-sugars. The Rosaceæ were low in dextrin, but all high in undetermined matter. The buckwheats seem characterized by an almost entire absence of sucrose and by the presence of tannin bodies. The basswood honeys were all relatively high in dextrin. This was also true of the sumacs, the poplar, oak, hickory, and other tree honeys, all these containing considerable quantities of honeydew. In addition to a high dextrin content, the latter were also characterized by a relatively high amount of ash. Honey gathered from plants or blossoms containing tannin, as the sumac and hop, usually gave pronounced reactions for tannin. The tupelo, mangrove, and sage honeys were all distinguished by their high content of levulose. Individual differences and peculiarities such as those noted can only be referred to in a very general way; the number of samples analyzed were so small for many of the varieties, and the admixture of other kinds of nectar in certain instances so uncertain that it was impossible to draw any sweeping conclusions as to the composition of each particular honey type."

Environment or locality frequently has a very marked influence on the composition of honey, but the data reported are not regarded as sufficient for general deductions.

The Hawaiian honeys examined offer a striking example of the effect of local conditions on composition, having a high ash content largely due to an excess of chlorids, explainable probably by the large amount of salt contained in the soil water of the islands. Some of the Hawaiian samples contained large quantities of honeydew, which has a pronounced effect on the physical qualities of the honey.

"The light-colored honeys are very much darkened through the blending with honeydew, and the property of granulating is also much diminished. The presence of honeydew in very large amount also affects the flavor and odor of honey, giving it a taste and smell resembling that of molasses."

As regards the composition of American honeys and the detection of adulteration, the author states that 20 per cent of the large number of commercial samples analyzed were found to contain "commercial glucose varying in amount from small quantities (when it was apparently added to prevent granulation) to as much as 80 per cent; 12 per cent of the samples exceeded 8 per cent sucrose, and 8 per cent of the samples gave the reactions for artificial invert sugar with both ammoniacal-silver solution and anilin acetate.

"Bottled honeys are frequently labeled by some floral designation, and these honeys, even when within the standard, often show a suspicious variation from the analyses of such honeys of known floral origin, especially as regards sucrose content. The microscopic examination of these honeys frequently shows an almost complete absence of pollen from the flower in question. Bee keepers and bottlers of honey are sometimes exceedingly careless in the labeling of their products and apply the name of almost any flower, thinking that they keep within the requirements of the law so long as their product is pure honey. This is a mistake, as the product should be labeled exactly according to its origin. The composition of different honey types and the possibility of establishing special standards for these are questions which will require further study."

A bibliography of literature on honey from 1892 to 1907, compiled by A. H. Bryan, is appended to the bulletin.

A microscopical study of honey pollen, W. J. Young (*U. S. Dept. Agr., Bur. Chem. Bul. 110, pp. 70–88, pls. 5*).—With a view to securing data for use in the identification of honey numerous microscopical studies were made of pollen of plants commonly visited by bees and of honey sediments, the results being reported in detail and fully illustrated by means of plates. The author's results have been summarized in a systematic way, providing a key to the pollens commonly found in American honeys which facilitates their identification with the microscope. The methods followed in the microscopical work are described.

In addition to pollen grains in honey, crystals of calcium oxalate and calcium phosphate are found and sometimes crystals of dextrose. Structures of animal origin, such as hairs and other appendages of insects, are occasionally found, and hairs, fragments of tissues, etc., of vegetable origin and small fragments of comb are always present. Dust and other accidental contaminations are also nearly always present. In honeys which have been adulterated with glucose, starch grains, frequently changed by heat, often occur and may have been added in the adulteration.

The deterioration of sugars on storage, N. Deerr and R. S. Norris (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 24, pp. 31*).—In a great majority of cases of deterioration of sugars the fall in polarization can be connected with bacterial activity, according to the authors' investigations, though such a change may be noted without bacterial action being evident. So long as sugars do not contain more than 1 per cent of moisture the danger of bacterial action is small, since moisture is a requisite condition for bacterial growth.

"Four distinct organisms are of frequent occurrence in Hawaiian sugars, one of which was of very frequent occurrence in sugars which deteriorated; these are now being studied.

"The capacity of sugars for absorbing moisture varies largely, and this is an important factor in determining the keeping qualities of the sugars. Some evidence exists that the amount of moisture absorbed is connected with the amount of chlorids in the sugars.

"A sugar when dried will, when exposed to a damp atmosphere, absorb moisture; such a sugar will then be in a condition liable to deterioration. In factories which experience trouble with deterioration of sugars we suggest the experimental use of an interior paper lining as a means of protecting the sugar from atmospheric changes."

Investigations on the use of sulphur and its combinations in the sugar house, F. ZERBAN (*Louisiana Stas. Bul. 103, pp. 80, dgms. 6*).—The studies reported have to do with the kind and amount of sulphur as sulphites in the Louisiana sugar house products and with the character of such products, and the use of different amounts of sulphur, as well as studies of different methods of clarification. This study of clarification from a chemical, economic, and legal standpoint was undertaken in view of the food inspection decision of the United States Department of Agriculture that sugar products shall not contain over 0.035 per cent sulphur as sulphites.

According to the author's results, a minimum quantity of sulphur dioxid in sugar products necessitates liming the juices to as near neutrality as possible.

From the results obtained the author concludes that "the use of a smaller amount of sulphur than that usually employed by any one planter is not necessarily followed by a decrease in the sulphur content of his after products. Only if we use so little sulphur that we keep within the limit of the solubility of sulphite of lime, a further reduction of the sulphur causes a reduction of it in the after products. This limit is reached with about 0.06–0.07 per cent of sulphur dioxid. But this quantity is itself so small that it will not aid sufficiently in the clarification of our cane juice, and a further reduction would not accomplish the purpose of clarification. Although it does not make much difference from a legal standpoint how much sulphur we use, if we go beyond a certain quantity, it does make a great deal of difference in the clarification. The more sulphur we use, the more impurities are removed and the greater is the decoloration obtained. . . .

"Only a very material reduction in the quantity of sulphur used in sulphitation results in a reduction of sulphur dioxid in the after products.

"The quantities of total sulphur for equal concentration are very nearly constant in all runs, at least do not vary long enough to be of any consequence. . . .

"The sugar manufacturers working with modern effects and vacuum pans may use less sulphur than open-kettle houses, and their products will still contain a quantity of sulphur dioxid far above the limit of 0.035 per cent. They may even cut down the sulphur used in clarification without reducing it in their molasses. And if they were to use so little sulphur that the molasses contains less than 0.035 per cent, a large part of the impurities which we can at present remove from the cane juice would remain in it and render our final products, sugar as well as molasses, less pure."

From a summary of evidence the author believes that the toxic effects of sulphur dioxid are determined by the amount of free sulphur dioxid present, which can be measured by ascertaining the iodin-absorption value.

"We have shown by our studies that even our factory sirups contain only a very small quantity of free sulphur dioxid, and it is more than probable that the final molasses will contain only traces of it."

Studies of clarification with hydrosulphites did not give uniform and definite results and so final conclusions were not drawn.

Camorsite, a commercial clarifying agent, was not considered satisfactory since it contains aluminate of barium.

As regards the occurrence of tin and zinc in sugar products, neither metal was found in commercial samples examined, nor could zinc be found in the soil in a number of localities where Louisiana cane is grown. Nevertheless, since heavy metals of this sort may occur in soil, the author believes that caution should be exercised in drawing deductions when such metals are found in sugar products.

Composition and cooking qualities of potatoes, R. Harcourt (*Rpt. Farmers' Insts. Ontario, 1906, pt. 1, pp. 71–77*).—Results are reported of analytical studies and cooking tests of 81 samples of potatoes from different Canadian provinces. The highest scores as regards cooking quality were assigned to varieties which took comparatively a long time to mature, though some such varieties received very low marks. A further study of the subject is, in the author's opinion, necessary before general conclusions can be drawn.

Poisonous beans (Phaseolus lunatus), W. Busse (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 12, pp. 737–739*).—A summary of data on the possible toxic properties of *Phaseolus lunatus*, the effect of cooking on wholesomeness, and related questions, the data being discussed with special reference to the importation of beans from the Orient into Germany.

Concerning the constituents of seeds of Pinus cembra, E. Schulze (*Landw. Vers. Stat., 67 (1907), Nos. 1–2, pp. 57–104*).—The results of an extended study of the composition of the shell, hull, and kernel of this variety of pine nuts are reported.

So-called capsaicin from paprika, A. Nestler (*Ztschr. Untersuch. Nahr. u. Genussmtl., 13 (1907), No. 12, pp. 739–744*).—From his experimental studies the author concludes that paprika with no sharp flavor is made by extracting sharp sorts with alcohol, as all the mild varieties which he examined contained some capsaicin. No more than traces, if any, of capsaicin was found in the leaves of different sorts of paprika plants examined.

Yeast extract, A. Wiebold (*Arch. Pharm., 245 (1907), No. 4, pp. 291–311*).—From the analytical and other data reported the author concludes that the best yield of yeast extract of good flavor and quality is obtained when yeast is allowed to undergo autodigestion.

A cheese called Daua-Daua made from the seed of Parkia africana, H. Fincke (*Ztschr. Untersuch. Nahr u. Genussmtl., 14 (1907), No. 8, pp. 511–520, figs. 9*).—A microscopical and analytical study of a material somewhat resembling cheese in appearance made by African natives from oil-bearing seed (*Parkia africana*). Methods of manufacture are described.

Unutilized fishes and their relation to the fishing industries, I. A. Field (*U. S. Dept. Com. and Labor, Bur. Fisheries Doc. 622, pp. 50, pl. 1*).—In a discussion of methods of profitably utilizing dogfish of different sorts, sand shark, toadfish, etc., data are summarized regarding the use of fresh, canned, and dried dogfish and experiments on its culinary quality are reported. The evidence presented, in the author's opinion, indicates that dogfish flesh is palatable and wholesome.

Marketing of Irish eggs, poultry, and fruit in 1906 (*Dept. Agr. and Tech. Instr. Ireland Jour., 7 (1907), No. 3, pp. 504–511, figs. 12*).—Different methods of marketing eggs, poultry, and fruit are described and reasons for the superiority of certain methods pointed out, the article as a whole dealing with local market conditions.

The canning industry of Ontario, T. B. RIVETT (*Rpt. Farmers' Insts. Ontario, 1906, pt. 1, pp. 131–143*).—Statistical and other data regarding the commercial canning and preserving of fruits and vegetables in Ontario.

Keeping quality, transportation, storage, and preservation of meat, D. A. DE JONG (*Pharm. Weekbl., 44 (1907), pp. 762–776; abs. in Chem. Zentbl., 1907, II No. 15, pp. 1260, 1261*).—The author's conclusion is that cold storage at 0 to 4° C. in air with not over 75 per cent relative moisture is the best method of preserving meat.

Preserving food by cold storage, J. DE LOVERDO (*Conservation par le Froid des Denrées Alimentaires. Paris, 1907; rev. in Rev. Hyg. et Pol. Sanit., 29 (1907), No. 8, pp. 711, 712*).—A handbook of cold storage as related to the preservation of food. This constitutes a volume of the series entitled "Encyclopédie des Aide-mémoire."

Fireless cooking [and other food topics], H. G. SHARPE (*Rpt. Commis. Gen. [U. S. Army], 1907, pp. 10–14*).—The author states that a special form of fireless cooker has been devised in connection with the subsistence department experiments on the preparation of food. Information is also given regarding Army training schools for bakers and cooks, the foods supplied in the Philippines, and the reduction of the emergency ration.

The corn cook book, ELIZABETH O. HILLER (*Chicago, 1907, pp. 58*).—A collection of tested recipes for the preparation of foods from corn meal, hominy, cornstarch, etc., and for cooking green corn.

Food and drug inspection, C. D. WOODS and J. M. BARTLETT (*Maine Sta. Bul. 151, pp. 48*).—The bulletin, intended primarily for dealers, discusses the guaranty of foods and drugs under the State pure food law, dyes, chemicals and preservatives, and other questions, and reports the results of a number of samples of salt fish, clams, oysters and scallops, sausages, honey, molasses, vinegar, and cream of tartar.

The inspector reported approximately 450 violations of the Maine pure food law. "These, however, were for the most part technical, and the matter has been cleared up and adjusted by correspondence and either the goods were withdrawn from sale or were properly branded."

Ground cinnamon, A. MCGILL and A. LEMOINE (*Lab. Inland Rev. Dept. [Canada] Bul. 138, pp. 7*).—This report includes data on the examination of 33 samples of ground cinnamon and a discussion of the results with reference to standards.

Results of the official examination of wine for the fiscal year 1905–6. I, Statistical inspection of wine (*Arb. K. Gsndhtsamt., 27 (1907), No. 1, pp. 1–10*).—Official reports by different authors of the examination of wine in the provinces of the German Empire, with an introduction by A. Günther.

Results of the official examination of wine for the fiscal year 1905–6. II, Statistical examination of must (*Arb. K. Gsndhtsamt., 27 (1907), No. 1, pp. 94–182*).—Reports by different authors of the examination of wine must carried on at the wine experiment stations in the provinces included in the German Empire.

Synopsis of State food laws (*Food Law Bul., 2 (1907), No. 23, pp. 251, 253–256*).—A digest of existing State pure food legislation. The material was gathered by A. H. Beckmann for the Wholesale Grocers' Association and codified by W. C. Breed.

Food and drugs index (*U. S. Dept. Agr., Div. Pubs. Circ. 5, pp. 12*).—A detailed index of Circulars 19 and 21, Office of the Secretary, and Food Inspection Decisions, 1–87, published by this Department in connection with the food and drug inspection.

Infant feeding and its influence on infant mortality in the Philippine Islands, W. E. Musgrave and G. F. Richmond (*Philippine Jour. Sci., 2 (1907), No. 4, pp. 361–385, chart 1*).—In connection with a discussion of infant feeding in the Philippine Islands, analyses are reported of a number of sorts of condensed milk and similar goods, cows' milk, goats' milk, carabaos' milk, and mothers' milk (Caucasian woman in Manila and Filipino women).

The average composition of carabao milk was as follows: Fat 10.63 per cent, sugar 3.73 per cent, protein 6.31 per cent, ash 0.88 per cent, total solids 21.44 per cent, solids by evaporation 22.09 per cent, water 77.90 per cent, solids not fat 11.41 per cent. The milk had an average specific gravity of 1.036.

Workingmen's diet, J. Tribot (*Rev. Soc. Sci. Hyg. Aliment., 4 (1907), No. 1, pp. 17–24*).—In continuation of earlier work (E. S. R., 19, p. 563), the author reports the results of investigations made with workingmen employed at different trades. The protein content of the rations eaten by the different groups at the principal meal varied from 46.3 gm. to 62.7 gm. per man, the fat from 44.7 gm. to 68.7 gm., and the carbohydrates from 29.4 gm. to 100.4 gm.

Experiments with the Pettenkofer respiration apparatus, E. Rost (*Abs. in Biochem. Centbl., 6 (1907), No. 16–17, p. 647*).—A brief account of a paper presented before the International Congress of Hygiene and Demography in Berlin, 1907, reporting the results of experiments on the carbon dioxid and water excreted by man as measured by the Pettenkofer respiration apparatus, and the results of control experiments designed to show the accuracy of the apparatus.

Concerning taste. I, C. T. Becker and R. O. Herzog (*Ztschr. Physiol. Chem., 52 (1907), No. 5–6, pp. 496–505*).—Experimental and other data are reported regarding the difference in intensity of flavor of substances of similar chemical nature. The intensity of flavor of the carbohydrates tested was in the following order: Cane sugar, levulose, milk sugar, dextrose, maltose, and galactose, milk sugar and dextrose being alike in this respect.

The physiology of digestion. I, Properties and composition of gastric juice obtained from the dog by sham feeding, R. Rosemann (*Arch. Physiol. [Pflüger], 118 (1907), No. 8–10, pp. 467–524*).—A study of the total dry matter, ash constituents, hydrochloric acid content, and organic material of gastric juice is reported. According to the author's observations, the amount of chlorin in the gastric juice secreted in 3½ hours may be equal to one-fourth of the total amount present in the body.

The chemistry of digestion in the animal body. XI, The gastric digestion of food containing a number of ingredients, E. S. London and A. Sagelmann (*Ztschr. Physiol. Chem., 52 (1907), No. 5–6, pp. 482–484*).—The experimental data obtained with a dog showed that the stomach exercised a selective function in the digestion of food containing more than one ingredient.

Protein metabolism in relation to the work of digestion, W. Roehl (*Arch. Physiol. [Pflüger], 118 (1907), No. 8–10, pp. 547–550, pl. 1*).—From a 7-day test on a nitrogen-free diet, of which he was himself the subject, the author concludes that the work of digestion, like muscular work, does not cause an increase in the amount of nitrogen excreted in the urine. The increased amount of nitrogen excreted in the urine on a proteid diet is derived from the protein eaten. When the diet contains no nitrogen the amount excreted in the urine becomes practically constant after a few days and is equivalent to about 2.5 gm. per day. He concludes, therefore, that 3 gm. of nitrogen per day is the lowest value with which it is possible to maintain nitrogen equilibrium.

Fat from a physiological and chemical standpoint, A. Jolles (*Die Fette vom physiologisch-chemischen Standpunkte. Strasburg, 1907, pp. 71; rev. in Österr. Chem. Ztg., 10 (1907), No. 16, p. 229*).—A summary and discussion of the newer theories on the chemistry and physiological value of fat.

The absorption of fat in the intestine, G. E. Wilson (*Univ. Toronto Studies, Physiol. Ser., 1906, No. 6, pp. 20, pls. 2*).—The author concludes from microscopical studies of the condition of fat in the intestinal walls that this constituent "is taken up in particulate form by the striated border, either as neutral fat or fatty acid—in short, as an emulsion."

Influence of fatigue upon efficiency in the performance of muscular work, H. Öhrwall (*Skand. Arch. Physiol., 19 (1907), No. 4-5, pp. 262-335, pls. 3, figs. 5*).—From a large number of ergographic experiments, which are reported in full, the author concludes that fatigue not only lowers but also injures efficiency. If work is continued after the state of fatigue is reached there is danger of lessening the skill which one has already attained.

ANIMAL PRODUCTION.

Commercial feeding stuffs of the United States: Their chemical examination, J. K. Haywood and H. J. Warner (*U. S. Dept. Agr., Bur. Chem. Bul. 108, pp. 1-71, 87-94*).—With a view to securing data of value in feed inspection work under State pure food laws, analyses were made of a large number of samples of commercial feeds, particular attention being paid to the different constituents of the carbohydrate group. The materials analyzed included cotton-seed meal, linseed meal, corn and corn products, distillery and brewery products, wheat feeds, oat feeds, corn and oat feeds, mixed feeds, sugar and molasses feeds, barley meal, barley screenings, mixed rye feed, proprietary stock feeds, animal meals, and poultry feeds.

As a whole the cotton-seed meals examined had a satisfactory protein content. Most of the samples showed no reducing sugar though a few contained a small amount. The values for fat on an average were lower than the averages generally quoted, indicating, according to the authors, that fat is more completely removed from cotton-seed meal than was formerly the case.

Microscopical examination of the linseed meals showed that the majority of them contained weed seeds in greater or less abundance. The presence of such material is to be expected and "it is only when they are of a poisonous variety or in excessive quantities that their presence is reprehensible."

The results of the analyses of the corn products, wheat brans, sugar and molasses feeds, brewery and distillery products, and animal meals were, in general, satisfactory and did not show any adulteration.

In the case of wheat bran and middlings, the authors believe that there is more or less confusion and that the two classes of goods should be more clearly differentiated in trade.

With respect to poultry feeds, the authors note that many of them are sold under names which are misleading. "Such names as 'Laying food,' 'Egg-builder ration,' and 'Forcing food' at least imply that the foods in question have certain egg forcing properties in addition to their ordinary food value. Such is not the case, however, the foods only increasing the amount of laying by supplying to the hen those food constituents which keep her in first-class physical condition and which are needed to build up the egg and shell. Since protein is one of the constituents usually lacking in the food ordinarily fed to chickens, and since also it forms a large portion of the egg, the foods which contain this constituent in large amounts are generally to be preferred."

A general comparison of commercial and standard home-grown feeds shows that in a large number of cases "the home-grown feeds are superior to the commercial feeds, especially in the case of those commercial feeding stuffs bearing a fancy name, which entirely masks the ingredients used. Furthermore, in many cases the commercial mixtures that do really have a higher nutritive value than the ordinary home-grown feeds could be much more economically prepared on the farm by buying the standard concentrated feeds, such as blood meal, cotton-seed and linseed meal, etc., and mixing them with home-grown crops."

Commercial feeding stuffs of the United States: Microscopical examination, B. J. HOWARD (*U. S. Dept. Agr., Bur. Chem. Bul. 108, pp. 72-86, pls. 6*).—Histological studies are reported of the principal constituents of cattle feeds, including the feeding stuffs themselves, weed seeds, medicinal or condimental materials, and such animal products as meat meal, bone meal, oyster and clam shells, and dried blood.

The plates which accompany the text facilitate the detection of normal and abnormal constituents of feeding stuffs.

Inspection of commercial feed stuffs, P. H. SMITH and L. S. WALKER (*Massachusetts Sta. Bul. 120, pp. 1-36*).—The feeding stuffs examined under the State law included cotton-seed meal, linseed meal, flax feed, gluten feed, dried distillers' grains, malt sprouts, brewers' grains, wheat middlings, mixed wheat feeds, wheat feeds with admixtures, wheat bran, dairy feeds, molasses feeds, rye feeds, calf meal, corn meal, ground oats, hominy meal, corn and oat feeds, fortified starchy feeds, meat scraps, bone meal, meat and bone meal, granulated milk, poultry mash and meal, chick and scratching grains, and alfalfa and clover meals.

According to the authors, "there has been a noticeable improvement in the observance of the feed law, it being necessary to serve fewer notices for infringement than ever before. Practically all of the jobbers and manufacturers either ship their goods with guaranty attached to packages, or, in the case of bulk shipments, furnish tags and statements covering the law. At present the trouble is largely with the retailers, who neglect to attach tags furnished or who are ignorant of the legal requirements."

A large proportion of the cotton-seed meals were found to be deficient in protein.

"Cotton-seed meal has been one of the most valuable protein concentrates available to the northern dairyman. Its consumption, however, is sure to be curtailed, unless adulteration is checked and a reform in the methods of dealing is speedily brought about. It is assuredly for the interest of the southern merchant to use every means in his power to see that this most valuable product is unadulterated, that it is properly branded, and that it substantially conforms to the guaranty placed upon it."

With respect to brewers' grains, the authors consider a good quality of this feed to be "usually an economical concentrate, and attention is called to this seemingly neglected feed stuff."

The wheat feeds with admixtures examined, the authors state, were unusually poor, the protein content being very low, and attention is directed to the fact that the consumer purchasing such goods pays nearly as much per ton for feed containing 30 or 40 per cent of ground corncobs as for a high grade of wheat feed.

Feeding stuff control in the year 1906, F. Barnstein (*Sächs. Landw. Ztschr., 55 (1907), Nos. 11, pp. 229–232; 12, pp. 251–254; 13, pp. 293–296*).—The analytical and other work carried on at the Möckern Experiment Station in connection with feeding stuff inspection is reported and discussed.

Feeding stuffs (*Sächs. Landw. Ztschr., 55 (1907), Nos. 20, pp. 454–456; 21, pp. 474, 475; 22, pp. 505, 506; 23, pp. 651–654; 24, pp. 674–677*).—Data are given regarding the character and amount of analytical work carried on in connection with feeding stuff inspection at the Pommritz Experiment Station.

Classifying corn bran (*Saaten, Dünger u. Futtermarkt, 1907, No. 41, pp. 1153–1156*).—From a discussion of the character and composition of corn by-products the conclusion is reached that declarations on such goods should state that they are milling by-products consisting principally of the bran and hull portions of the grain and designed only for use as feeding stuffs.

Concerning corn oil, II. Stiegeler (*Pure Products, 3 (1907), No. 11, pp. 532–535*).—In a discussion of corn oil and other corn by-products data are given regarding the waste from a yeast factory operated according to the old Vienna process in which 20 to 25 per cent corn and a like amount of maize malt were used.

The agricultural value of French rye grass (Arrhenatherum elatius) and of orchard grass (Dactylis glomerata), and the harmful results which follow feeding sour grass, K. Holy (*Ber. Physiol. Lab. u. Vers. Anst. Landw. Inst. Halle, 1907, No. 18, pp. 96–190, pl. 1, figs. 3*).—The opinions of different authorities as to the value of French rye grass and orchard grass are briefly given and comparative culture experiments with these and a number of other species are reported. The author found that yellow oat grass (*Avena flavescens*), as compared with other valuable grasses, removed from the soil a very small quantity of plant food, while at the same time yielding a large quantity of forage. Orchard grass was most exacting with reference to soil fertility, and was found to retain the percentage of stand in grass mixtures as indicated by the proportion of seed sown only on very fertile soil.

In experiments with sheep the average coefficients of digestibility of French rye grass were as follows: Protein 45.07, fat 15.03, nitrogen-free extract 56.27, crude fiber 55.25, and ash 29.34 per cent. Similar values obtained for orchard grass were protein 46.63, fat 20.82, nitrogen-free extract 57.44, crude fiber 59.10, and ash 36.34 per cent.

From a chemical study of these 2 sorts of grass, the results obtained in the digestion experiments, and determinations of the nitrogen excreted in the urine, the author concludes that the orchard grass is a less satisfactory feeding stuff than the rye grass owing to the fact that the saw-like edges of the blades, which contain a large amount of silica, irritate the intestinal tract.

The article also contains an extended study of the constituents of so-called sour hay (*Carex* spp., etc.) from which the author concludes that the harmful effects noted when such material is fed are also due to a similar cause.

Dried beet pulp, J. Tribondeau (*Semaine Agr. [Paris], 26 (1907), No. 1370, pp. 269, 270*).—In an article quoted from *l'Agriculture de la région du Nord*, data are given regarding the successful feeding of beet pulp to draft cattle and other farm animals.

Denatured sugar in the feeding of farm animals (*Betterave, 17 (1907), No. 432, pp. 303, 304*).—A brief account of a test in which steers were fed with favorable results sugar denatured with cacao pulp.

Feeding experiments with peptone feed, Gerlach (*Illus. Landw. Ztg., 27 (1907), No. 80, pp. 697, 698*).—So-called peptone feed is made by drying the stomach contents of slaughtered animals and mixing the material with molasses. A feeding test was made with lambs which led the author to conclude that the digestible nutrients of peptone feed have a higher feeding value than those in other concentrated feeds but that it has no other special recommendation.

Lime and its feeding value, M. Hoffmann (*Sächs. Landw. Ztschr., 55 (1907), No. 7, pp. 141–144*).—The relative amount of calcium and phosphoric acid in a number of feeding stuffs, the importance of these ash constituents in animal feeding, the value of bone meal and other commercial feeds supplying such mineral constituents, and related questions are discussed.

Farm animals (*Jahrb. Deut. Landw. Gesell., 22 (1907), pp. 467–555*).—This report includes papers by a number of authors containing statistical and other data regarding horses and other farm animals, poultry raising, rabbits, and fish.

The importation of Argentina cattle into Italy, A. Pirocchi (*Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 6 (1907), V, No. 6, pp. 635–658, figs. 14*).—An exhaustive study of methods of cattle shipping, the condition in which cattle are received, quality of the flesh, and related topics.

Experiments in beef production in Alabama, J. F. Duggar and W. F. Ward *U. S. Dept. Agr., Bur. Anim. Indus. Bul. 103, pp. 28, pls. 11*).—Three tests were made to compare cotton-seed hulls with farm-grown forage (sorghum hay and shredded corn stover) and to determine the relative values of cotton seed, cotton-seed meal, and corn. In each series of tests 10 lots of 5 steers each were used. The value of shelter was also taken into account and the merits of grades and scrubs.

Considering the results for 3 years, the average daily gains with cotton-seed meal as the sole concentrated feed were as follows: 1.55 lbs. when fed with cotton-seed hulls, 1.39 lbs. when fed with cut sorghum fodder, and 1.19 lbs. per head when fed with shredded corn stover.

"With mixed cowpea and sorghum hay as the roughage, and with one-third of the concentrate consisting of cotton-seed meal, the daily gain per steer from feeding cotton seed was 1.68 lbs., and from feeding an equal weight of corn-and-cob meal 1.71 lbs.

"To produce 1 lb. increase in live weight required practically equal amounts of cotton seed and of corn-and-cob meal. This shows that under the conditions of these experiments a pound of cotton seed was equally as valuable as a pound of corn-and-cob meal. Cotton seed is cheaper per pound, and hence is the more economical feed.

"Cotton-seed meal proved more effective and economical than corn-and-cob meal when each was fed as an appetizer in connection with cotton seed.

"When, in a ration of cotton-seed meal, one-third of the weight of the cotton-seed meal was substituted for an equal weight of corn-and-cob meal, the daily gains were slightly increased. The amount of concentrate per pound of gain was greater with the mixed ration, making this slightly less profitable than the ration containing cotton-seed meal as the sole concentrate.

"The effect of shelter varied with the character of the winter. In 2 tests shelter increased the daily gains and decreased the amount of feed required per pound of gain. . . .

"The scrub steers in 2 experiments made practically the same daily gains at practically the same cost as the grades. At the beginning of the other experiment the scrubs were thinner, and they gained more rapidly and economically.

"Heavy shrinkage during shipment, due to unusual delays, greatly reduced the possible profits.

"The average selling price of grades in New Orleans ranged between $3.97 (for the pen fed on corn stover, cotton-seed meal, and corn-and-cob meal) and $4.42 (for the pen feed on cotton-seed meal and hulls).

"Of the eight rations fed the following were the most profitable at prices assumed: (1) Cotton-seed meal and hulls; (2) two-thirds cotton-seed meal, one-third corn-and-cob meal, with cotton-seed hulls as roughage. With cotton-seed meal at $20 a ton, hulls were worth in these experiments from $4.62 to $5.82 per ton. Inferior sorghum fodder and corn stover were worth less than hulls. . . .

"The scrubs dressed out 54.3 per cent as compared with 57.2 per cent for grades fed on a similar ration.

"In percentage of dressed weight the best showing was made by the steers fed on cotton-seed meal and hulls, and the poorest by those fed on corn stover or on sorghum fodder. The steers receiving mixed hay ranked lower in percentage of dressed weight than those fed on hulls and higher than those fed on sorghum or corn stover."

Artificial feeding of calves, L. MISSON (*Rev. Agr. [São Paulo], 13 (1907), No. 144, pp. 325–334, figs. 3*).—The gradual substitution of skim milk, cooked with some starchy material, for whole milk gave satisfactory results in calf feeding. Corn meal, cassava meal, or a good quality of wheat bran is recommended for supplementing skim milk. Data are given regarding the quantities fed and gains made by a number of calves.

Calf feeding, A. GOUIN and P. ANDOUARD (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 6, pp. 504–508, 551–555*).—General deductions from experimental data previously reported (E. S. R., 19, p. 468).

Feeding inverted starch to calves, R. HANNE (*Milch. Ztg., 36 (1907), No. 23, pp. 267, 268*).—From a feeding test reported the author concludes that starch inverted with diastasolin may be used in place of fat to supplement skim milk in calf feeding and that it gives satisfactory results.

Diastasolin in feeding calves, A. DOLSCIUS (*Deut. Landw. Presse, 34 (1907), No. 85, p. 671*).—According to the feeding test which the author briefly reports, satisfactory results were obtained when a vegetable fat (as contained in linseed cake) and starch, inverted with diastasolin, supplementing skim milk were compared with whole milk.

Experiments at Proskau Dairy Institute on feeding pigs with starch inverted with diastasolin, KLEIN (*Milch. Ztg., 36 (1907), No. 39, p. 461*).—Experimental data are briefly reported which led to the conclusion that somewhat better results were obtained with the inverted starch than with untreated starch or potato flakes.

Feeding tests with different sorts of dried potatoes and dried beet chips, ROSENFELD (*Landbote, 1907, No. 38; Ztschr. Spiritusindus., 30 (1907), No. 42, pp. 456, 457*).—In the experiments with pigs which are reported, the most satisfactory results as regards cost of production were obtained with dried potato chips. Potato flakes were more readily eaten, the author states, than potato chips or beet chips.

Sheep farming in America, J. E. WING (*Chicago, 1907, rev. ed., pp. 367, pls. 26, figs. 34*).—A new and revised edition of this handbook in which fine wool breeds, mutton breeds, cross breeding, selection of sheep, feeding, care, and management, washing, shearing, marketing, diseases of sheep, and related questions are considered. The volume also contains a chapter on Angora and milch goats.

Sheep feeding, W. T. McDonald and J. S. Malone (*Oklahoma Sta. Bul. 78, pp. 57–64*).—Using 4 lots of 10 lambs each, alfalfa hay and cowpea hay with corn meal, and corn stover and alfalfa hay with corn meal and cotton-seed meal 3:1, and prairie hay with the last mentioned grain mixture were studied, the feeding period covering 20 weeks.

The total gains per lot ranged from 393 lbs. on the prairie hay ration to 521 lbs. on cowpea hay and corn meal. The greatest range in dry matter eaten per pound of gain was also noticed with these two lots, being 7.35 lbs. with the last mentioned lot and 8.33 lbs. with the first mentioned lot. The gain was most cheaply made on the cowpea hay ration, costing 5.43 cts. per pound, and was most expensive on the prairie hay ration, costing 6.41 cts. per pound. The shrinkage in shipping was greatest with the lot fed alfalfa hay and corn meal, being 9.3 per cent, and was least with the lots fed the cowpea hay and prairie hay rations, being 7.9 per cent in each case.

The tentative conclusions which the authors draw follow:

"Alfalfa hay or cowpea hay with corn makes an excellent ration for fattening lambs from the standpoint of rapidity of gains, economy of gains, and quality of the finished product.

"Even when corn stover was given a value of $4 per ton, a ration consisting of equal parts of alfalfa hay and corn stover for roughness and three parts corn meal and one part cotton-seed meal, was almost as economical as a ration consisting of alfalfa hay and corn meal.

"Though smaller and more expensive gains were made on prairie hay, corn meal, and cotton-seed meal, the quality of the finished carcasses was equal to that of those from the lambs fed the other rations.

"In order to secure the minimum amount of shrinkage in shipping, lambs should be fed prairie or Bermuda hay for the roughness for a couple of days before shipping."

The Angora goat and mohair industry, W. R. Robinson (*Queensland Agr. Jour., 19 (1907), No. 4, pp. 204–208*).—Various questions concerned with the feeding, care, and management of Angora goats under local conditions, the prices paid for Australian mohair, the quality of Angora mutton, and similar topics are considered.

The stable handbook, T. F. Dale (*London and New York, 1907, pp. XIV+90, pls. 32, figs. 9*).—The feeding, care, and management of horses are discussed with special reference to English conditions.

Barley as a feed for horses, M. Rasquin (*Jour. Soc. Agr. Brabant et Hainaut, 52 (1907), No. 26, pp. 689–691*).—On the basis of data obtained in feeding barley to street-car horses in Brussels and other information, the author concludes that barley may be used as a satisfactory substitute for oats in horse feeding.

Market classes and grades of horses and mules, R. C. Obrecht (*Illinois Sta. Bul. 122, pp. 93–186, figs. 71*).—An intelligent estimate of the value of horses and mules necessitates an understanding of market requirements and of classes and grades, subjects which the author discusses in detail. The principal factors which determine market value of horses and mules, as he points out, are soundness, conformation, quality, condition, action, age, color, education, and general appearance.

"Horses or mules of a general type are grouped into classes, for convenience and a definite understanding; and in most instances the names of the classes are suggestive of the use to which they are put. The classes of horses are divided into subclasses which embody those of a similar type but slightly different in size, weight, action or the use to which they are put. Mules are not divided into subclasses.

"The market classes are: Draft horses, chunks, wagon horses, carriage horses, road horses, saddle horses, mining mules, cotton mules, sugar mules, farm mules, and draft mules. . . .

"The grades distinguish the good from the poor animals within the classes and subclasses. The grades are choice, good, medium, common, and inferior. . . .

"The breed to which a horse belongs has but little influence upon his market value, and the classes are not determined by the breeds, but by the individuality and conformation of the horse; however, a judicious use of choice pure-bred sires is best suited for the production of marketable horses."

The characteristics of the different classes and grades are considered in detail.

The Asiatics—Brahmas, Cochins, and Langshans—all varieties (*Quincy, Ill.* [*1907*], *pp. 96, pls. 2, figs. 71*).—A number of papers by different authors on the Asiatic breeds of poultry. The origin of Asiatic breeds, their peculiarities, egg production, market qualities, breeding, and related questions are discussed. The majority of the papers are reprinted from *Reliable Poultry Journal.*

Poultry for export, H. V. HAWKINS (*Jour. Dept. Agr. Victoria, 5* (*1907*), *No. 9, pp. 544–546, fig. 1*).—In a discussion of trade requirements, production of white flesh, and related questions, the author describes a light and convenient crate for shipping poultry.

Chicken coops, H. DE COURCY (*Jour. Bd. Agr.* [*London*], *14* (*1907*), *No. 6, pp. 368–370, figs. 4*).—The construction of chicken coops of different sorts, which the author considers satisfactory, is described.

Electric incubators (*Sci. Amer., 97* (*1907*), *No. 19, p. 336, figs. 5*).—An incubator is described in which heat is supplied by electricity.

Fifth annual international egg-laying competition, D. S. THOMPSON (*Dept. Agr. N. S. Wales, Misc. Pub. 1093, pp. 21, figs. 14*).—The average egg yield recorded was 171 per hen in the 6-months' test, the cost of feed $1.40, and the average profit over feed $2.16. In a breed test the largest average egg yield, 190.16 eggs per hen, was obtained with Cuckoo Leghorns. Some general data are given regarding foods and feeding, egg market, and related questions.

Different methods of preserving eggs, R. NOURISSÉ (*Les Divers Procédés de Conservation des Œufs. Paris, 1907, pp. 31*).—The author has summarized and discussed data on the preservation of eggs by cold storage, preservative solutions, evaporation, etc.

Squab investigations, C. K. GRAHAM (*Connecticut Storrs Sta. Bul. 50, pp. 13–59, figs. 20*).—For several years the station has possessed pigeon lofts and has studied experimentally various questions connected with squab raising under conditions similar to those of individuals attempting squab raising for market. On the basis of experience gained and data recorded various questions concerned with the feeding, care, mating, management, and housing of pigeons, the killing and marketing of squabs, and similar topics are discussed.

Pigeons, the author notes, depreciate in value with age and are considered to be in their prime when 3 years old. Very few pairs "pay for their feed after they are 7 years old. . . .

"There are many varieties of pigeons that are used for squab producers, but probably the most common is the Homer. These are very vigorous birds, and there are few breeders who do not consider a certain amount of Homer blood essential. They are often crossed with Runts, Duchesses, or Dragoons. The Runt is a very heavy bird, but in most cases is considered a little slow in productiveness, while the Duchesse gives a feathered-leg squab, but has a tendency to increase the weight. . . .

"A pair of young pigeons will seldom produce their first squabs in less than 8 months, and 2 pairs are about all they will produce before they are 1 year old. The first pair, as a rule, are small and are generally sold as culls. Five pairs of squabs a year are about all that a good flock of pigeons will average per pair, and there are many flocks that are doing less than that, while a few are doing more. It is seldom that a pair of pigeons are found that will produce over 7 pairs in a year.

Data giving the results obtained from 14 individual pairs in a loft of crosses show that the total number of squabs raised per year ranged from 4 to 17, the average days required for maturing squabs from 21 to 29, and the average weight of the squabs from 8.75 to 13 oz. each.

A pair of squabs, whose weight is recorded in detail, weighed when 2 days old 1 oz. each and when matured at 26 days 14 and 16 oz., respectively. Data are also given showing the daily weight of the first squabs raised by 6 pairs of Homers, together with the age of the breeders.

The advantages of proper mating are shown by the fact that the average number of squabs per pair thus mated was 4 the first year and 5 the second year; the cost of feed for each pair of breeders in the 2 years, $1.27 and $1.33, respectively, and the average returns for each pair of breeders for the 2 years, $2.06 and $2.66. With pigeons carelessly mated the average number of squabs per pair in the 2 years was 2.5 and 3; the cost of feed per year for each pair of breeders, $1.20 and $1.21, and the average return for each pair of breeders, $1.11 and $1.41.

"In order to avoid dark-skinned squabs it is advisable not to breed from birds that have very dark legs or beaks. . . .

"Often it is necessary to remate birds in order to secure stock suitable for market. Certain pairs will produce dark-skinned birds, while if they are remated it is quite possible to get a much better quality of squab. This is also done where crosses from different varieties of pigeons are being tried, and where some peculiar defect in size or shape may be noticed in squabs from certain pairs."

As regards feeding pigeons, "different methods of feeding have been tried at this station, also different kinds of feed, but the most satisfactory has been a mixture of equal parts of cracked corn, hard wheat, Kafir corn and Canada peas, with the addition of a little hemp and millet seed during the molting season. Flat troughs about 5 in. wide and 2 in. high were used, and somewhat more grain than the birds required for a meal was put in, as we liked to have a little in the trough that they could have access to at all times.

"There is nothing that will so retard the growth of a squab as to feed it at irregular intervals. This can be overcome by feeding the old birds regularly. We fed twice daily, about 7.30 in the morning and 4.30 in the afternoon. Another very satisfactory method was to feed a mixture of equal quantities of wheat, Kafir corn, and peas from a trough, giving the birds just what they would eat up clean in about half an hour, and leaving a hopper of good cracked corn before them all the time. There is not much gained by changing the feed according to the season, as has often been advocated, although we do add a little extra cracked corn during the cold months. There is no more expensive attempt at economy than in trying to save by not giving the pigeon her full allowance of peas, although this is a high-priced grain."

Some data are recorded regarding the comparative merits of cheap and more expensive grains for pigeon raising. When 50 pairs were fed for a year a cheap mixture of grains (cracked corn, poor quality wheat, rape, millet, peas, and

Kafir corn) the average cost of feed for each pair of breeders was $1.03, the average number of squabs produced per pair of breeders 4.5, and the average value of the squabs per each pair of breeders $2.10. There was an estimated net loss on the lot of $4.28, not including labor. When a more satisfactory grain mixture made up of whole corn, wheat, Kafir corn, Canada peas, and millet was fed to 12 pairs, the average number of squabs per pair was 5.5, the average cost of feed for each pair of breeders $1.96, the value of the squabs for each pair of breeders $3.13, and the calculated total profit for the lot, not including labor, $6.05.

Some data are recorded regarding the prices paid in the New York market for squabs.

"The only consideration given, aside from weight, is to color. Dark-skinned squabs are in very poor demand, and usually bring 25 per cent less than the light-skinned bird. The consumer is becoming more particular, and many of them to-day are careful to select only full-breasted stock; but while they willingly pay a premium for such stock, it is only in rare cases that the producer realizes any difference in returns because of this lack of meat on the breast, provided the birds have the weight."

As regards pigeon houses "heated houses have not been considered a success, and for climate such as we have in Connecticut, provided the north and west sides are well sided and lined with paper so that there is no danger of draft, the unheated house should be satisfactory. No such care need be taken in regard to the south side of the house. In one of our lofts the windows of the south side have not been closed for over a year, and the birds are fully as healthy as any at the station and have produced as many squabs. . . .

"Probably one of the worst enemies that pigeons have is the rat, and in order to fight it the houses are generally built from 18 in. to 2 ft. from the ground, using trapdoors from the floor to the ground, in order to keep the wind from blowing under and lowering the temperature of the house during the cold weather. The most economical construction is a house built 5 ft. from the floor to the eave in front (the south side) and from 6 to 8 ft. on the north side. Houses with a roof of this style are naturally very hot in summer, but if built high on the south side it will be found almost impossible to get a satisfactory alley in the building. For this reason a building that is 12 to 14 ft. wide and 6 ft. from the floor to the eave, and from 8 to 9 ft. from the floor to the ridge, leaving the loft free from floor to roof, is most satisfactory. A house such as this with capacity for 200 pairs should cost about $1.50 per pair, including the cost of fly, nests, water fountains, etc. This is figuring labor and lumber at average Connecticut prices. . . .

"The partitions between the lofts should be tightly boarded to the tops of the nests, as there is naturally a draft through the house, yet in order to get proper ventilation it is well to use poultry netting for division from the tops of the nest to the roof. This will permit free circulation of air in the peak of the house, especially by having windows on the north side that may be opened when necessary, particularly during the summer months."

Ostrich farming (*Queensland Agr. Jour., 19 (1907), No. 4, pp. 188–192, pls. 4*).—Feeding, care, and management of ostriches on a Natal ostrich farm are discussed on the basis of personal experience.

The rate of growth of ostrich feathers, J. E. Duerden (*Agr. Jour. Cape Good Hope, 31 (1907), No. 4, pp. 435–438*).—"The rate of growth of ostrich feathers can be determined by tying at intervals a ring of fine thread around the growing feather at the mouth of the socket, and then measuring the distance of the ring or rings at intervals of a few days.

"In the most vigorous birds with long plumes the wing feathers grow at least 1.75 in. per week or 0.25 in. per day; in weakly birds the growth in length may be scarcely half these amounts.

"The rate of growth varies in different ostriches, dependent upon the strain of the bird and the condition of health of the bird. Under certain conditions of health growth may cease altogether, or the appearance of new feathers may be long delayed."

Observations on the fixation of oyster spat at Barnegat, N. J., 1907, J. NELSON (*New Jersey Stas. Rpt. 1907, pp. 207-256, pls. 13*).—The quotations which follow are taken from the author's summary of the results of his studies of oyster propagation carried on in continuation of earlier work (E. S. R., 19, p. 677), the investigations this season being confined to natural spatting in a single locality.

"The eggs developed so rapidly that filtration of the water showed the presence of oyster larvæ, practically, only after they are in the shell stage. In this stage, called the protoconch stage, there is steady growth for at least a week, and possibly three weeks, with a great loss by death, until the fry are ready to attach themselves to cultch. . . .

"At the time of 'setting' there had been an increase in bulk, approximately, 60 times that of the young in the first protoconch stage, and the two valves of the shell, though at first equal, have by this time become unequal, the umbo of the left valve being more prominent than that of the right.

"The fry settles down on the surface of the cultch on the velum and mantle folds, and cements the edge of the left valve fast to the cultch. Then there is added a fringe of shell to both valves, that of the left being cemented fast to the cultch. At the hinge this so-called silphologic addition projects in a straight line on each side, inclined at an angle to each other. These silpho additions are repeated constantly, enlarging the size of the shell, until by two weeks an area, 3 mm. in diameter, is covered. . . .

"Experiments in the artificial propagation of oyster fry did not succeed until the oysters were spawning.

"Only those lots that developed a protoconch were considered to have been successful. . . .

"In our experiments involving daily plantings, the best shells caught from 100 to over 200 natural spat in from 3 to 5 days.

"The young spat can be recognized by means of a magnifying glass, from the very hour it becomes attached. . . .

"By means of the filtration of sea water it is practicable to keep record of the development of natural fry, so that the date when shells should be planted can be quite accurately determined."

DAIRY FARMING—DAIRYING—AGROTECHNY.

Report of the dairy husbandman, G. A. BILLINGS (*New Jersey Stas. Rpt. 1907, pp. 39-55*).—Two feeding experiments are reported, in one of which the object was to study the effect of a large amount of dried corn distillers' grains in the ration, and the other to study the problem of summer feeding of dairy cattle with respect to whether corn silage can be used as a substitute for forage crops or pasturage.

In the study of the value of distillers' grains *v.* ground oats, gluten feed, oil meal, and bran in a ration for milch cows it was found that the ration containing 6½ lbs. daily of dried distillers' grains was very profitable and that the animals maintained their thrifty condition on it. This ration cost 23.2 cts. per day as compared with 28.39 cts. for the ordinary grain ration. The cost of milk was 0.42 ct. per quart and that of butter 5.1 cts. per pound less from the former than from the latter ration. The butter produced from the dried distillers' grains was firm, of good quality, and very marketable.

In continuation of an experiment previously mentioned (E. S. R., 19, p. 272) soiling crops *v.* silage and oat and pea hay as summer feed for dairy cattle were studied, using 4 cows instead of a whole herd as in the preliminary experiment. Records were kept of the yield of milk and butter and the cost of each ration during two periods of 15 days each. In respect to the yield of milk and of fat, and to the gain in financial returns, there was no appreciable difference in the use of either ration. The quality of the milk did not materially change and there was no preceptible difference in the appearance of the animals or in their weight. In the author's opinion the results indicate that corn silage can be fed safely and economically during the summer months.

Report of experiments on the feeding of dairy cattle, E. PORTER (*County Council Lancaster, Ed. Com., Agr. Dept., Farmers' Bul. 5, pp. 37*).—The experiments reported were carried out to test the relative values of bone meal, undecorticated cotton cake, and gluten meal as indicated by the quantity and composition of the milk produced and also by the flavor and quality of the cheese and butter made from the milk. One test was made during the summer and another test during the winter.

The heaviest yield of milk and the largest profit were produced in the summer test by the cotton cake and in the winter experiment by the gluten meal. In both experiments the various feeds did not appreciably influence the percentages of fat or of solids-not-fat in the milk. In the course of these experiments it was observed that a fall of rain after a period of drought caused an immediate improvement in the fat content of the milk. Bone meal was best for the production of cheese, gluten meal giving results nearly equal to it, but cotton cake not being so satisfactory. For the production of butter, bone meal was also the best, but was followed closely by the cotton cake.

In an appendix to this publication an account of milk tests is included, from which the conclusion is drawn that "the total yield of milk, and the percentage of fat contained therein, can be estimated with approximate accuracy by testing on one day each fortnight and multiplying the average of the two tests by fourteen."

Third year's comparison between potatoes and turnips as food for milch cows, H. ISAACHSEN (*Ber. Norges Landbr. Höiskoles Virks., 1906-7, pp. 213-224*).—In quantities of 6, 10, or 11 kg. per head daily, potatoes replaced similar quantities of dry matter in turnips in the rations of 12 cows. No unfavorable influence on the quality of the butter or its chemical characteristics (iodin number, Reichert-Meissl number, or water content), nor on the general health and well-being of the cows, resulted from the feeding of potatoes.

Home-grown cattle feeds, J. B. LINDSEY (*Massachusetts Sta. Bul. 120, pp. 36-38*).—The author discusses home-grown and commercial cattle feeds and points out the high value of corn, clover, and alfalfa as compared with commercial products.

Purchased cattle feeds, J. B. LINDSEY (*Massachusetts Sta. Bul. 120, pp. 38-40*).—Data are summarized regarding the composition of commercial cattle feeds as shown by digestion experiments carried on at the station.

Complete rations for dairy stock, J. B. LINDSEY (*Massachusetts Sta. Bul. 120, pp. 41-43*).—A number of mixed rations are suggested and a table is given showing the local market prices of cattle feeds for 1907.

Report of dairy herds and their milk production, T. E. WOODWARD and J. G. LEE, Jr. (*Louisiana Stas. Bul. 102, pp. 28*).—A report of an investigation undertaken by the Louisiana Experiment Stations in cooperation with the Bureau of Animal Industry of this Department at Hammond, La.

In the 38 dairies from which statistics were gathered there were in all 1,027 cows giving milk, an average of 27 for each dairy. These produced 1,582 gal. of milk daily, or 1.54 gal. per day per cow, with an average of 4.54 per cent of fat and 8.96 per cent of solids-not-fat. The price of milk was 17 cts. per gallon, making the income per day per cow 26 cts. The daily feed cost per cow was 12 cts., leaving a daily profit of 14 cts., not counting labor, interest on investment, insurance, or depreciation.

Cost of producing milk, G. A. Billings (*New Jersey Stas. Rpt. 1907, pp. 79–86*).—Thirty-one cows comprising the herd during the year ending April 1, 1907, produced on an average per cow 6,288 lbs. of milk containing 4.38 per cent of fat.

"Notwithstanding the advance in feed since 1906, the average cost of food per cow for the year was $45.84, 3 cts. less than the average for the previous year. This is explained by the greater amount of alfalfa grown on the farm, and by the purchase of high grade corn distillers' grains, in carload lots at wholesale price. . . .

"The feed cost of production of 100 lbs. of milk was 72.87 cts., of which the roughage was 39.6 cts. and the feeds 33.2 cts. The cost of 1 qt. of milk was 1.5 cts. and 1 lb. of butter 14.27 cts."

The cost of labor, interest, and decrease on herd per quart of milk is figured at 1.48 cts., making the total cost of milk 3.04 cts. per quart. According to the values calculated, "at 4 cts. a quart for the milk the farmer does not receive full market rates at the present time for his hay or corn, even when no interest is charged on the investment in land and improvement."

The unprofitable cow and how to detect her (*Massachusetts Sta. Circ. 12, pp. 4, figs. 2*).—A brief explanation of the purposes and methods of cow-testing associations.

The progress of dairying in Canada (*Rpt. Dairy and Cold Storage Comr. Canada, 1907, pp. 4–83, pls. 7*).—A general discussion, including statistics, of the cheese industry, the butter industry, sanitation in dairying, improvement of dairy herds, and cow-testing associations. In connection with the latter topic, a large number of records of individual cows for 2 to 8 months are given, showing the value of such accounts in the improvement of dairy herds.

The data presented indicate that "in order to ascertain the value of a cow it is necessary to test as well as weigh her milk. Frequently there is a gross difference of 50 lbs. of fat in the milk of 2 cows giving 4,300 lbs. of milk each. Many farmers are not only working hard but working overtime unnecessarily keeping 12 cows when 7 would yield as much milk and butter fat. Cows of mature age lower the average production of a herd just as often as heifers. Many cows are evidently kept too long."

Cheese factories and creameries in Canada (*Rpt. Dairy and Cold Storage Comr. Canada, 1907, folio map*).—A map showing the location of these establishments, to accompany the report of the dairy and cold storage commissioner. (See previous abstract.)

Dairying in Norway in 1907 (*Norsk Landmandsblad, 27 (1908), No. 5, pp. 49–54*).—A general survey of the conditions of the industry during the year.

Milk chemistry and dairying in the second half of 1907, Grimmer (*Milchw. Zentbl., 4 (1908), No. 2, pp. 57–74*).—Accounts of work in these lines are briefly reviewed.

The composition of milk, H. D. Richmond (*Analyst, 33 (1908), No. 385, pp. 113–117*).—The average composition of 14,967 samples of milk analyzed during

1907 was as follows: Specific gravity 1.0322, total solids 12.69 per cent, and fat 3.75 per cent. "As has been generally observed, the fat was lowest in June, and highest in November. Low solids-not-fat occurred in July and August, but the average was scarcely so low as in former years. The average amount of fat—3.75 per cent—is slightly higher than has been found for the past three years, and during the later months of 1907 the milk was distinctly better than the average."

A discussion of a study of the relation between the aldehyde figure and the protein of milk and between the aldehyde figure and the acidity of milk is included.

Action of acid phosphates of potassium and sodium on the coagulation of milk by rennet, C. GERBER (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 3, pp. 141-143*).—The differences between raw and boiled milk, with respect to the action of acid phosphate of sodium or potassium on coagulation by rennet, lead the author to query whether the antiferments that some investigators have reported in raw milk and to which they attributed the nature of a diastase are not simply the albumin and the globulin of the milk.

Yoghurt, Bulgarian sour milk, A. LUERSSEN and M. KÜHN (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 8-9, pp. 234-247; abs. in Chem. Zentbl., 1908, I, No. 6, p. 547*).—In addition to a review of the present knowledge regarding yoghurt, the authors report some investigations in which tests were made of yoghurt ferment obtained from different sources. The morphological and biological characteristics of three yoghurt bacteria, *Bacillus bulgaricus*, a spore-forming bacillus, and a diplostreptococcus, isolated by the investigators, are described. In experiments, which the authors made upon themselves, on the acclimatization of the yoghurt bacteria, these organisms did not colonize in the intestines and did not drive out the intestinal bacteria. In the authors' opinion the use of milk soured with pure cultures as an article of diet for sick persons and also in ordinary life may be recommended, but claims for its specific healing action should be accepted with caution.

The influence of lactic ferment on the intestinal flora of mice, J. BELONOVSKY (*Ann. Inst. Pasteur, 21 (1907), No. 12, pp. 991-1004*).—The experiments reported show a very considerable modification of the intestinal flora of mice fed on grain that had been sterilized and inoculated with "Bulgarian ferment" (organisms isolated from yoghurt; see above abstract). There was a "decrease in the number of bacteria, a general transformation of the flora, diminution of the power of producing putrefaction, and in the virulence of the excreta. The action of the ferment can not be attributed exclusively to the production of lactic acid; products secreted by the bacteria also play a considerable part. The ferment becomes acclimated in the intestine after a certain period, and when it is no longer administered remains for some time in the intestine. Cultures made in milk exercised a beneficial action upon the mice infested with bacteria of Danysz, but this action was due exclusively to lactic acid."

The thermal death points of pathogenic micro-organisms in milk, M. J. ROSENAU (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 42, pp. 85, fig. 1*).—The author states that the temperature at which milk should be pasteurized depends on the thermal death points of the pathogenic organisms which contaminate it. Those most frequently found in market milk are the organisms causing tuberculosis, typhoid fever, diphtheria, scarlet fever, dysentery, and Malta fever, none of which have resisting spores. According to the results of the investigations reported, milk heated to 60° C. and maintained at that temperature for 20 minutes may be considered safe so far as conveying infection with any of these micro-organisms is concerned.

Pasteurizing milk and pathogenic bacteria, especially the tubercle bacillus, D. A. de Jong (*Milchw. Zentbl., 4 (1908), No. 1, pp. 13-17*).—The experiments considered indicate that pasteurization is not sufficient under all circumstances to render milk free from pathogenic organisms. To avoid danger from tuberculosis it is necessary to use milk that is sterilized or cooked, or produced by cows that show no symptoms of tuberculosis and do not react to tuberculin.

Bacteria in milk and artificial refrigeration for dairymen, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 111, pp. 31-54, pls. 15, fig. 1*).—The advantages of refrigeration as a means of restraining the growth and development of bacteria in milk are explained, with particular reference to experiments at the West Virginia Experiment Station in the study of the adaptability of artificial refrigeration for the purposes of the dairy farmer, with a small ice machine installed with that object in view. With this apparatus the milk from the station herd of about 20 cows is cooled to the freezing temperature as soon as it is milked. It is then bottled and stored in the cold storage room until delivered to the consumers in the local market. Only one delivery is made per day, even in the hottest weather of summer, and the milk bottles are not iced when taken out of cold storage, yet there has not been a single complaint from any of the consumers on account of sour milk. The machinery has been run without a single breakdown or accident of any kind for an entire season by a man who has had no previous experience in the handling of machinery.

The authors believe that "small refrigerating plants have a big field of usefulness on the better class of dairy farms which supply milk and cream to our towns and cities for direct consumption." Though a refrigerating apparatus is rather expensive and the cost of operating it must be taken into account, on the other hand only one delivery a day is necessary, the milk is so much improved in quality that it commands a better price, and surplus milk can be kept longer in a marketable condition.

An account is given of the history and theory of ice machines and several types are illustrated, as well as the methods of piping refrigerator boxes. Appended to the discussion are lists of manufacturers of ice machines and insulating materials and of books on refrigeration and trade journals.

Producing milk with few micro-organisms, W. Kuntze (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 12-14, pp. 420-443*).—The importance of such factors as cleanliness in the dairy, special feeding, use of sterile utensils, pasteurization or cooking the milk, healthy cows, etc., are considered, with a discussion of results obtained in experiments by the author and other investigators.

A new systematic method of milking in the case of sound and diseased udders, Sondergaard (*Abs. in Deut. Landw. Presse, 35 (1908), No. 6, pp. 56, 57, figs. 7*).—Like that of Hegelund (E. S. R., 14, p. 286), this method has for its object the removal of the milk that after ordinary milking remains in the capillary passages of the udder. This is accomplished by certain manipulations of the udder, which work the milk down through the larger channels into the milk cistern. Success depends upon the proper manipulation of the udder. The system of manipulation devised by the author differs from that of Hegelund.

Birmingham milk and preservatives, J. F. Liverseege (*Jour. Roy. Inst. Pub. Health, 16 (1908), No. 4, pp. 225-230*).—A discussion of data compiled from records of tests for boric acid and formic aldehyde in milk by the food and drug inspectors of Birmingham.

Contribution to the study of milk sold in Montevideo, H. Vande Venne (*Rev. Secc. Agron. Univ. Montevideo, 1907, No. 2, pp. 160-194*).—Data obtained in the examination of 100 samples of milk are reported and discussed with reference to the number of bacteria, boiling, sterilization, pasteurization, proportion of fat, acidity, presence of pathogenic bacteria, and other conditions.

On the causes of variations in the water content of butter, O. Jensen (*Mælkeritid, 20 (1908), No. 46, pp. 943–951*).—A discussion of the theories of formation of butter, and the various factors that influence its water content.

Investigation on the fat content of cheese in relation to that in milk, Van der Zande (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat., 1907, No. 2, pp. 52–62*).—The materials used in these investigations were obtained from 29 dairy establishments in Friesland and 20 in North Holland. A large amount of data is given regarding the fat content of milk and of cheese prepared from it, and also of the dry substance of the milk and the cheese. The results obtained show no definite relation between the fat content of milk and that of the cheese, nor between the fat contents of the dry substance of the milk and of the cheese.

Contribution to the improvement of the technique of making Emmenthal cheese, R. Steinegger (*Landw. Jahrb. Schweiz., 22 (1908), No. 2, pp. 37–45*).—The effects of such factors as warming the milk, conditions just before coagulation, subsequent heating, removing the cheese, and pressing are considered in the light of both practical factory experience and scientific laboratory experiments.

[Acts of Assembly regarding the dairy and food division], N. B. Critchfield, J. Foust, and O. D. Schock (*Penn. Dept. Agr., Dairy and Food Div. Bul. 160, pp. 69*).—This is a compilation of the statutes relating to the creation of the office of dairy and food commissioner and his duties under such statutes, and of the Acts of Assembly, the enforcement of which is placed in the hands of the commissioner, and has been prepared to meet the demand from manufacturers, dealers, and others for information concerning such legislation. A brief summary of various court decisions relating to these statutes is appended.

A theory of the extraction of juice by milling, N. Deerr (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 22, pp. 22*).—"It is intended in this bulletin to follow out algebraically the processes in general use applied to the extraction of sugar from canes, and to obtain expressions representing what results when different methods of working are employed under ideal conditions, that is to say, when the water used in saturation processes works at its maximum efficiency. Results so obtained will be strictly comparative amongst themselves, although they will not represent the imperfect conditions holding in the actual factory work."

Use of formaldehyde solution in sugar mills, R. S. Norris (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 23, pp. 16*).—This is a report of results obtained in tests of the use of formaldehyde in place of lime in sugar mills for the prevention of fermentation in juices when it becomes necessary to store them at the end of the week or after a breakdown. "Under the conditions of these experiments it was found that as small a quantity as 1 part of formalin to 40,000 of juice preserved it for 24 hours, and that 1 part in 2,500 kept it from fermenting for 4 days. It will probably be found, however, that under the conditions in which the juice is stored in mills it will be necessary to use larger proportions of formalin."

Hops: Air-dried or kilned (*Allg. Brau. u. Hopfen Ztg., 47 (1907), No. 230, pp. 2481, 2482; Ztschr. Gesam. Brauw., 30 (1907), pp. 592, 593; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 2, p. 85*).—"It is pointed out that hops possess a considerably higher brewing value when air-dried than when subjected to kiln drying, which latter causes not only a diminution in the weight of the hops, but also partial loss of their most valuable constituents. This deterioration is, of course, intensified if, as often happens, the hops are subjected to a high temperature for 7 to 8 hours. In thin layers hops will dry in the air in 2 or 3 days if the weather is favorable, and will retain their color perfectly."

The manufacture of glue and gelatin, L. THIELE (*Die Fabrikation von Leim und Gelatine. Hanover, 1907, pp. 158, figs. 44; rev. in Österr. Chem. Ztg., 10 (1907), No. 15, p. 211*).—A handbook for manufacturers and others interested in glue and gelatin making.

VETERINARY MEDICINE.

Results of loco-weed investigations in the field, C. D. MARSH (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 37, 38*).—In this preliminary report attention is given to *Aragallus lamberti* and *Astragalus mollissimus*. By means of feeding experiments it has been shown that *A. lamberti* is poisonous to horses, sheep, and cattle, and that *A. mollissimus* is injurious to horses. The latter seldom causes trouble in cattle for the reason that they rarely eat it. The principal pathological changes are anemia, congestion of the stomach walls, and occasionally gastric ulcers. There is also an excess of fluids in the body cavity. In some locations it may be possible to avoid the loco trouble by eradicating the weeds. Success has been had in treating locoed cattle with strychnin and locoed horses with Fowler's solution. Epsom salts is also recommended as part of the treatment.

Laboratory work in loco-weed investigations, A. C. CRAWFORD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 39, 40*).—Symptoms similar to those observed in stock on the range may be produced in rabbits by feeding *Astragalus mollissimus* and *Aragallus lamberti*. It is stated that inorganic constituents, particularly barium, cause the poisonous effects in locoed animals. Symptoms similar to those seen in locoed animals may be produced by feeding barium. Not all loco plants contain barium and those which do not appear to be inactive. It is suggested that the administration of epsom salts might be beneficial in changing the barium salt to a sulphate and thus rendering it insoluble.

Mountain laurel, a poisonous plant, A. C. CRAWFORD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 21-35, pl. 1*).—The literature relating to *Kalmia latifolia* was critically examined by the author and references are made to the results obtained by various investigators in the study of the poisonous principles of this plant. Since the visit of Kalm to this country in the eighteenth century, mountain laurel has been known to be a poisonous plant.

The investigations reported by the author were carried out on sheep and rabbits. It was found that sheep weighing 25 kg. could receive as much as 35 gm. of the dried leaves without showing symptoms of poisoning. Sheep weighing 33.5 kg., however, were killed within a few hours by the administration of 85 gm. of the dried leaves unless diarrhea occurred. A number of examinations were made to determine the lesions caused by mountain laurel. In one case the trachea was found to be injected and serum was found in the pleural cavity. The lungs were edematous and the intestines showed a condition of hemorrhagic enteritis. Similar effects were produced upon rabbits. The symptoms usually observed include salivation, excessive formation of tears, vomiting, and paralysis of the legs. The active principle of mountain laurel is probably andromedotoxin, which is also found in a number of related plants. This substance was isolated by the author from the filtrate obtained after the precipitation with ether.

In treating animals poisoned with mountain laurel it is recommended that active purgation be produced and also vomiting, if necessary by hypodermic injection of apomorphin.

The supposed relationship of white snakeroot to milk sickness or trembles, A. C. Crawford (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 121, pp. 5–20, pl. 1*).—A critical review is given of the literature relating to milk sickness and its supposed cause and particularly of the experiments of E. L. Moseley along this line. The conclusion is reached that *Eupatorium ageratoides* has not been shown to be a poisonous plant nor to be the cause of milk sickness.

An outbreak of milk sickness which occurred in Illinois gave the author opportunity to investigate this trouble. Extracts of white snakeroot were fed to cats and dogs without producing any pathological symptoms. A lamb, weighing about 25 kg., ate 58 gm. of the fresh plant without being badly affected. The author ate over 300 gm. of an extract and 100 gm. of the dried plant without experiencing any serious effects. The conclusion is drawn that white snakeroot is not the cause of milk sickness. The disease is more probably of bacterial origin.

Experiments with feeding stuffs suspected of being injurious, O. Appel and F. Koske (*Arb. K. Biol. Anst. Land u. Forstw., 5 (1907), No. 7, pp. 361–376*).—Wheat smut was fed to pigs, chickens, and pigeons by mixing it in known quantities in wholesome food. This material produced no pathological symptoms and no noticeable disturbances of any sort.

Likewise with diseased and rotten potatoes, it was found impossible to cause any bad effects by feeding them to pigs and cattle. Incidentally it was observed that the spores of wheat smut and *Bacillus phytophthorus* were almost completely destroyed by passing through the animal organism. Apparently, therefore, these diseases are not likely to be transmitted through manure.

The mechanism of the bactericidal action of the organism in infections, N. Pane (*Centbl. Bakt. [etc.], 1. Abt., Orig., 44 (1907), No. 6, pp. 535–541, pl. 1*).—In the presence of antibodies found in the blood serum pathogenic bacteria first undergo changes demonstrable by the microscope and are later swallowed by the phagocytes, in which their remains may be demonstrated as granules by staining with methylene blue. The microscopic extracellular change is not demonstrable in cases where phagocytosis takes place rapidly. It was observed that in experimental anthrax in rabbits in which the phagocytic action was slow, granules appear in the anthrax bacillus and may be readily demonstrated with methylene blue. A slow destruction of bacteria in immunized animals which possess a highly active therapeutic serum is not to be confused with the same phenomenon which occurs in chronic cases of the disease

Certain phenomena of inactivation and of inhibition exhibited by precipitin antisera, D. A. Welch and H. G. Chapman (*Proc. Roy. Soc. [London], Ser. B, 79 (1907), No. B 534, pp. 465–473*).—It is maintained that inactivation and inhibition are separable phenomena, the latter appearing only after antisera have been heated to 75° C. Inhibition and solution of the precipitate by heated antisera, however, are inseparable phenomena. It is claimed that considerable evidence has been obtained which is incompatible with Ehrlich's theory of the substances concerned in precipitin reactions.

Transmission of rabies through the nasal mucous membrane, C. Fermi (*Centbl. Bakt. [etc.], 1. Abt., Orig., 44 (1907), No. 6, pp. 502–504*).—Mice and rats are very susceptible to infection from rabies virus placed upon the nasal mucous membrane. Nearly all of these animals thus contract a fatal infection. Most of the rats thus infected showed paralysis on the sixth day and died on the ninth day. Rabbits and guinea pigs are found to be far less susceptible to this form of infection.

Peculiar history and symptoms in a case of cachexia following rabies, Boden (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 42, pp. 591, 592*).—A clinical description is given of the symptoms observed in a dog which had recovered from the acute stages of rabies and which was in a persistent cachectic condition. As far as could be judged from external symptoms, there was no reason to diagnose the case as rabies. Inoculation experiments, however, with material obtained from the brain showed conclusively that the dog was affected with that disease.

The function of the spleen in trypanosomiases, A. Laveran and A. Thiroux (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 5, pp. 295-297*).—Additional evidence was obtained that in all cases of infection the trypanosomes disappear rapidly at the crisis of the disease, at least in cases which recover. This destruction of the trypanosomes, however, occurs in animals from which the spleen has been removed in the same maner as in normal animals. Apparently, therefore, the spleen has nothing to do with the disappearance of the trypanosomes.

The rôle of the spleen in trypanosomiases, A. Massaglia (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 14, pp. 572-575*).—The experiments outlined in this paper relate largely to the progress of surra in dogs from which the spleen had been removed, and to a study of the behavior of the trypanosomes under the influence of the spleen. It was found that trypanosomes obtained from the spleen do not differ in any respect from those which were taken from other organs or from the blood. The virulence of trypanosomes in the spleen did not disappear after death with any greater rapidity than that of those in the blood. In dogs from which the spleen had been removed surra developed in the same manner as in normal animals.

Surra in Indo China, H. Schein (*Ann. Inst. Pasteur, 21 (1907), No. 9, pp. 739-752*).—The various trypanosome epizootics studied by the author in Indo China have all been due to the same parasite. The infection has come from various centers where surra is known to prevail. The buffalo does not become vaccinated by one attack of surra and even after two attacks may still be a dangerous carrier of virulent parasites. Cattle and buffaloes are considered as the chief agents in the transmission of this disease.

In protecting horses against surra better drainage and other sanitary arrangements are recommended as well as separation of horses from all suspected cattle and buffalo. Albuminuria is a constant symptom of the disease at its crisis. The saliva of diseased horses is not virulent. The direct action of sunlight appears to have no effect upon the development of surra, but anthrax and other forms of septicemia cause the disappearance of trypanosomes in the blood.

Trypanosomiases of the Upper Niger, A. Laveran (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 5, pp. 293-295*).—Cattle which had been inoculated with the virus of the disease known as dabab were found, upon recovery from inoculation, to be completely refractory to *Trypanosoma soudanense*. It is believed therefore that this is probably the pathogenic organism of dabab.

The use of arsenious acid in trypanosomiases, A. Laveran and A. Thiroux (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 14, pp. 561-564*).—In the experiments reported by the authors the amount of arsenious acid found in the blood or lymph after 24 hours was quite insufficient to check the multiplication of the trypanosomes. Apparently the arsenious acid which has not been eliminated from the body at the end of 24 hours is already fixed in the tissues. It is suggested, therefore, that in order to obtain any germicidal results from arsenic it should be administered at shorter intervals.

The means of the dissemination of tuberculosis in animal experiments with particular reference to the bronchial glands, F. Oehlecker (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 7, pp. 65-102*).—Following upon the infection of the iliac glands, the spleen and its portal gland soon become involved with the tuberculous infection. It is to be supposed that after infection of the iliac glands the tubercle bacilli gain entrance to the thoracic duct and thus infect the spleen and lungs through the blood system. Careful examinations of guinea pigs killed at different periods after hypodermic injection in the abdominal region indicate that tubercle bacilli gain entrance to the blood very soon after the infection of the iliac glands, and that the infection in all cases is far in advance of the visible lesions.

In experiments with rabbits it was found best to use tubercle bacilli from cases of pearl disease since bacilli of human origin almost never caused an infection of the glands. In this series of experiments it was found that the bronchial glands are merely regional glands for the bronchi and lungs and are not essential distributing organs of the general lymphatic system of the body.

The specific differences of human and bovine tubercle bacilli, C. Spengler (*Centbl. Bakt.* [etc.], *1. Abt., Orig., 44 (1907), No. 6, pp. 481–485, figs. 2*).—It has been shown by Bonome that the extracts from bovine tuberculosis give no plural precipitation. The author argues therefore that human tuberculosis can not arise from animals, since human tuberculous sera show multiple agglutinins and precipitins. This multiple reaction in his opinion is due to the symbiotic nature of the tuberculous infection in man. It is maintained that both forms of the tubercle bacilli are found in man but that the disease in man is transmitted from one individual to another and is not transmitted from animals. The author suggests that the bacilli of pearl disease in cattle are probably a variety of the symbiotic pearl disease bacilli in man.

The precocious diagnosis of tuberculosis by ophthalmo-reaction, A. Calmette (*Compt. Rend. Acad. Sci.* [*Paris*], *145 (1907), No. 5, pp. 298–300*).—In the author's experience ophthalmo-reaction is more reliable than cuti-reaction to tuberculin. The former is believed to be a very accurate and valuable means of detecting infection with tuberculosis. The method also makes it possible to determine when recovery from a previous infection has taken place.

Vaccination against tuberculosis, S. Arloing (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *6 (1907), No. 7, pp. 832–837*).—A thorough study was made of the methods by which vaccine may be effectively inoculated into cattle and of the best means for retaining these vaccines. In the author's experiments modified human tubercle bacilli were used and also tuberculase, which was applied in accordance with recommendations of von Behring. It proved to be impossible to produce any noticeable vaccinating effect by the use of tuberculase.

Immunization of cattle to tuberculosis, A. Weber and C. Titze (*Tuberkulose Arb. K. Gsndhtsamt., 1907, No. 7, pp. 1–64*).—It has been shown beyond question by a number of investigators that cattle may be to some extent protected against subsequent tuberculous infection by previous treatment with tubercle bacilli of bovine origin. It was considered desirable, however, to obtain further evidence as to the harmlessness of this method and the duration of the immunity thus produced. To this end the authors carried on a long series of experiments upon cattle, making use of fresh cultures of human tubercle bacilli, bacilli obtained from tuberculosis in cold-blooded animals, other acid-fast bacilli, dead tubercle bacilli, bovo-vaccine, and tauruman.

It appears that the increased resistance which can be produced in cattle by the use of living human tubercle bacilli does not persist for more than 2 years. It is possible that among the cattle which are thus partly immunized to tuberculosis a number of cases are developed which are capable of transmitting the disease to other cattle and to man. This possibility must be borne in mind in forming conclusions as to the practicability of the method of vaccination.

The results of repeated experiments with cattle treated with bovo-vaccine indicate that the immunity thus produced is by no means satisfactory. The authors suggest that there are specially forcible reasons for reserving judgment on the value of von Behring's method of vaccination if it be borne in mind that according to von Behring tuberculous infection takes place chiefly through the alimentary tract. The vaccination of cattle against tuberculosis is therefore still in an experimental stage.

The von Behring method of vaccination against tuberculosis in its practical bearings, A. EBER (*Centbl. Bakt.* [etc.], *1. Abt., Orig., 44* (*1907*), *No. 6, pp. 569–607*).—A careful study has been made of a large number of cattle immunized against tuberculosis according to the von Behring method. The results obtained from tuberculin tests on these animals and post-mortem inspection indicate clearly that it is not possible by means of the von Behring method alone to control tuberculosis in badly infected herds. The method does not protect young animals against subsequent natural infection from association with diseased animals, and future experiments alone can determine its value in combination with other methods for the control of tuberculosis.

Bovine tuberculosis, V. A. MOORE (*New York Cornell Sta. Bul. 250, pp. 267–288, figs. 7*).—An account is presented of the cause, method of infection, period of incubation, duration, diagnosis, and control of tuberculosis. An outline statement is also given of the present status of bovine tuberculosis in New York. In eradicating the disease it is recommended that tuberculous animals be at once eliminated from the herd, that the tuberculin test should be applied to the whole herd, and that the nonreacting animals should be tested every 6 months until the herd is free from the disease.

Diseases of milch cows which are also infectious to man, P. BERGES (*Bol. Soc. Agr. Mexicana, 31* (*1907*), *Nos. 38, pp. 757–760; 39, pp. 766–768; 40, pp. 795, 796*).—A description is given of anthrax, actinomycosis, actinobacillosis, cowpox, rabies, mammitis, and septic and parasitic diseases, which commonly affect dairy cows and which may occasionally be transmitted to man.

Foot-and-mouth disease, L. GRANATO (*Rev. Agr.* [*São Paulo*], *13* (*1907*), *No. 146, pp. 436–442*).—The symptoms and lesions of this disease are briefly described. Particular attention is called to the possibility of transmission of foot-and-mouth disease from animals to man and vice versa.

Texas fever in German Southwest Africa, BRENNECKE (*Ztschr. Veterinärk., 19* (*1907*), *No. 10, pp. 441–443*).—In a herd of 295 cattle about 50 showed more or less pronounced symptoms of Texas fever. In the region where the outbreak occurred it was impossible to find any of the ticks which had been demonstrated to carry this disease. It was suggested, therefore, that the outbreak should be considered a secondary or recurrent form of Texas fever.

Pneumo-enteritis or Pasteurella bovis, W. ROBERTSON (*Agr. Jour. Cape Good Hope, 31* (*1907*), *No. 3, pp. 251–256, pls. 4*).—In the eastern coastal districts of Cape Colony a disease appears among cattle and sheep, often being referred to as lamziekte. This name, however, should preferably be retained for cases of malnutrition, which are readily remedied by the addition of phosphates and other mineral salts to the ration. Upon post-mortem examination of animals dead of pneumo-enteritis, the appearance of anemia and toxemia is very striking.

The disease has been known in Cape Colony for a number of years and occurs under both an acute and chronic form. It is due to an organism which has been isolated and shown to be pathogenic for calves, sheep, and horses. In certain seasons the disease causes an enormous loss among cattle. The author is inclined to the opinion that it is identical with so-called lombriz in Argentina and that in many cases it has been confused with attacks of stomach worms.

Remedy for internal parasites, H. P. MILLER (*Breeder's Gaz., 52* (*1907*), *No. 12, p. 517*).—Perhaps the most serious enemy of lambs is the stomach worm, for which during the past decade a great variety of remedies has been used, but without much success. As a rule, these remedies have been applied after evidences of infestation were already apparent, and, therefore, too late to prevent considerable financial loss. The underlying idea of the author's experiments was to provide a remedy that could be used as a preventive and which was cheap, easily applicable, and harmless. It is believed that such a remedy has been found in tobacco. Low-grade leaves commonly known as trash may be chopped up and mixed with equal quantities of salt. This mixture may be kept before the flock constantly without any fear of harm either to lambs or old sheep. The author is not certain whether flocks can be entirely freed from internal parasites by the use of tobacco in this form, but it appears that serious losses can be avoided.

Successful treatment of lungworms of sheep, Kroening (*Ztschr. Veterinärk., 19 (1907), No. 10, pp. 434–439*).—During the past 2 years the author had an unusually large experience in the treatment of lungworms of sheep. The symptoms caused by infestation with *Strongylus filaria* are described, and notes are given on the life history of the parasite. The remedies which have commonly been recommended in controlling this disease have failed to give satisfactory results. No permanent good has followed the inhalation of tar, carbolic acid, creolin, turpentine, tobacco, formalin, or menthol. In fact, fumes which are active enough to destroy lungworms are practically certain to be injurious to the sheep.

The author tested the value of intratracheal injections in the treatment of lungworms. For this purpose 5 gm. of a 1 per cent solution of carbolic acid was injected into the trachea by means of a trocar. The breathing of the affected sheep improved on the day following the injection, the cough became better, and the appetite increased. In some cases it was found necessary to give another injection after 3 days. In the case of sheep which already lay helpless upon the ground this treatment failed to bring about recovery, but in all ordinary cases an improvement took place immediately and recovery occurred after a few days.

Conditions which lead to outbreaks of swine erysipelas, Hoehne (*Berlin. Tierärztl. Wchnschr., 1907, No. 41, pp. 735–740*).—It is often difficult to account for outbreaks of swine erysipelas in countries where the disease is combated so vigorously as in the German Empire. During the past 10 years the author has made a number of observations for the purpose of determining predisposing causes which lead to outbreaks of the disease. It is believed that swine erysipelas scarcely occurs at present as an epizootic, but when it does appear in large herds of hogs the common form assumed is that of the diamond skin disease.

Sporadic outbreaks of swine erysipelas appear to be due to a reduction of the resisting power of hogs. This in turn may be the result of unsanitary conditions about hogpens, sudden changes of temperature, unsuitable feed stuffs, and weakness due to the prevalence of disease, particularly swine plague and hog cholera.

For the purpose of preventing outbreaks of swine erysipelas the author recommends to hog raisers that they should select breeding animals of the greatest possible vigor, particularly those with a heavy coat of hair. It is also urged that hogs be allowed to run upon pasture or that where this is not possible they be furnished with a dry sanitary yard. Sudden variations in temperature are believed to be perhaps the most potent cause of outbreaks of swine erysipelas.

The results obtained in preventive vaccination of swine erysipelas, D. F. Konev (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 8, pp. 663–725*).—It was found that the virus of swine erysipelas may be so attenuated that it will serve excellently well as a vaccine either in the prevention or cure of the disease. The virus when properly prepared is in no way dangerous to hogs of any age. The average loss after the use of this preventive vaccination is about 3 or 4 per 1,000. The use of 2 vaccines of somewhat different strength brings about a mild and benign form of the disease from which the animal recovers. The immunity thus produced persists for 1 to 2 years.

The treatment of azoturia in horses, A. Zimmermann (*Berlin. Tierärztl. Wchnschr., 1907, No. 40, pp. 714, 715*).—Clinical notes are given on 2 cases of paralytic azoturia in which the author had excellent results after bleeding the horses. Soon after bleeding, the paralytic symptoms were relieved, and hemoglobin was no longer observed in the urine. The rapid effect of bleeding is supposed to be due to a stimulus which this surgical interference adds to the metabolic processes in the animal.

Tracheal ulceration in glanders (*Vet. Rec., 20 (1907), No. 998, p. 122*).—It is maintained that ulceration of the nasal septum may exist in reacting horses without any enlargement of the submaxillary glands and without nasal discharge. Apparently mallein does not hasten the escape of glanders bacilli from lesions in the lungs into the trachea.

Tracheal ulceration in glanders, J. R. McCall (*Vet. Rec., 20 (1907), No. 1000, pp. 160, 161*).—The danger of infection from tracheal ulceration in cases of glanders depends upon a number of conditions which may develop during the course of the disease. In general about 8 per cent of reacting horses show tracheal ulceration, but in some outbreaks the percentage is much higher. A tabular statement is given of conditions observed in making post-mortem examination on 79 cases of glanders. In this list of cases 29 showed ulceration of the trachea, and in 18 of these cases there was no evidence of farcy.

Cuti-reaction and ophthalmo-reaction in glanders, H. Vallée (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 14, pp. 359, 360*).—While it is possible to obtain a reaction to mallein by the cutaneous method, the author nevertheless considers this method somewhat variable and therefore unreliable except in the hands of experienced veterinarians. It appears that the reaction to the cutaneous application of mallein depends largely upon the thickness or coarseness of the skin at the point of inoculation. Similarly, the ophthalmo-reaction is not considered as being so specific a reaction as takes place by the same method in the use of tuberculin.

Prophylaxis of glanders, C. Constant (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 14, pp. 352–356*).—For the complete control and eradication of glanders the author recommends the frequent application of the mallein test and the destruction of all horses which definitely react to it.

The glanders or farcy order of 1907 (*Vet. Rec., 20 (1907), No. 1000, pp. 157–160*).—In this regulation, which goes into effect January 1, 1908, definitions are given of the terms disease, diseased, and suspected. The legal procedure is outlined in the regulation of the importation of horses, notification of disease, detention and treatment of suspected animals, post-mortem examination of slaughtered animals, disposal of carcasses, and other matters relating to the control of glanders.

A study of certain cathartics, M. H. Reynolds (*Minnesota Sta. Rpt. 1907, pp. XXI–XLII, fig. 1*).—A comparative test was made of pilocarpin and eserin, alone and together with atropin and strychnin, and of barium with regard to their cathartic action and general effects when thus used upon horses. The smallest dose of eserin which gave good results was 1 grain and the largest dose of atropin used with eserin and pilocarpin and giving satisfactory results was 0.1 grain, and it is believed that ordinarily not more than half this amount should be used. The value of pilocarpin in connection with eserin is very doubtful. The usual dose of strychnin is set at 0.25 grain. In economy and permanence of chemical form, barium is preferable. Eserin is more easily administered. Barium, especially when given by the intravenous method, is more prompt in action. The results obtained in the comparison of the pain produced and muscular tremors were decidedly in favor of barium.

Vaccination experiments to determine the value of dog distemper sera, Puttkammer (*Arch. Wiss. u. Prakt. Tierheilk., 33 (1907), No. 6, pp. 583–612*).—An elaborate test was made of the serum of Piorkowski, but this serum failed to exercise any curative effect either in acute or slight cases of the disease and likewise failed to protect young dogs against infection from subsequent exposure to the disease. Similarly, another serum which had been placed upon the market and advertised as effective in the prevention or treatment of dog distemper gave entirely negative results. The symptoms of distemper were not affected in any way and healthy dogs were not protected against subsequent infection.

External otitis in dogs, P. Becker (*Monatsh. Prakt. Tierheilk., 18 (1907), No. 11–12, pp. 547–568, pl. 1*).—External otitis may affect dogs of all ages. Detailed clinical notes are given on 13 cases of this disease which were all due to infestation with *Dermatophagus auricularum canis*. The disease may assume catarrhal, purulent, ulcerous, or chronic forms according to the extent of infestation and the care which the affected dogs receive. The literature of the subject is discussed in connection with a brief bibliography.

Tuberculosis in dogs in Argentina, H. P. Ramos (*Bol. Min. Agr. [Buenos Ayres], 7 (1907), No. 4–6, pp. 257–261*).—A careful examination of dogs during life and after death from various causes showed that these animals are affected with tuberculosis in a much greater percentage than has commonly been suspected. Many cases of supposed pneumonia, cancer, and inflammatory diseases of the respiratory and alimentary tracts were shown to be tuberculosis. It is believed that most cases of cachexia in dogs accompanied with nasal discharges, if not readily recognizable as other specific diseases, should be considered as being tuberculosis.

Cestodes in Numida ptilorhyncha, B. Klaptocz (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 115 (1906), No. 6, pp. 963–974, pl. 1*).—The author examined the alimentary tract of guinea fowls received from Africa with the result that 2 species of tapeworms were found. These species are *Linstowia lata* and *Davainea pintneri*. The last species is described as new.

The necessity for the extension of meat inspection to game, Borchmann (*Arch. Wiss. u. Prakt. Tierheilk., 33 (1907), No. 6, pp. 521–582*).—The literature of this subject is critically reviewed in connection with an extensive bibliography. A practical classification of game birds and mammals is made for market purposes and particularly with reference to the possibility of inspecting such meat. Attention is called to the possible presence of dangerous parasites and bacteria in the meat of game and to the extent to which this meat is consumed. While it is evident that some form of inspection should be made of the meat of wild game, it is admitted that the introduction of such a measure would greatly increase the price of the meat and would be impractical except in the case of Berlin and a few of the other large cities.

The veterinarian's pocket counsel (*St. Joseph, Mo., 1907, pp. 168*).—Brief descriptions are given of the common disease and defects of domestic animals, together with a list of 68 medicinal preparations which may be used in the treatment of these diseases. The properties of common veterinary medicines are explained and a brief glossary is appended of scientific terms used in veterinary practice.

RURAL ECONOMICS.

Chapters in rural progress, K. L. BUTTERFIELD (*Chicago, 1908, pp. IX+251*).—This book presents some of the more significant phases of the rural problem which is said to be "isolation," and particularly describes some of the agencies at work in solving it. Chief among the latter are discussed road improvement, telephone service, interurban electric railways, many phases of agricultural education, farmers' organizations, the church, and general interest in rural problems. With these agencies at work in removing the feeling of isolation so characteristic of farm life, their operation during the past decade is believed to indicate for the future a steady improvement in rural conditions, a larger development of rural life, and a greater prosperity for agriculture.

An inquiry into the rent of agricultural land in England and Wales during the nineteenth century, R. J. THOMPSON (*Jour. Roy. Statis. Soc., 70 (1907), No. 4, pp. 587–624, dgm. 1*).—Tabulated data secured by investigation and from various sources are presented and discussed from the standpoints of actual and economic rent.

Under the former which considers only gross rent, the conclusion is drawn that "the average rent of agricultural land in England and Wales in 1900 was 30 per cent below the figure of 1872, 34 per cent below the maximum of 1877, and 13 per cent below the figure of 1846." The economic rent is determined by taking the average of gross rent for the century as equal to £1, and deducting estimated expenditures for repairs, management, interest, etc., as equal to 15s. 5d., the balance of 4s. 7d. representing the rent per acre of the land itself, i. e., the economic rent. Thus the annual net return to the nation during the century on 27,400,000 acres was about £6,300,000. The paper is followed by a discussion.

Variations in the value of land in England during the nineteenth century, A. DE FOVILLE (*Écon. Franç., 36 (1908), I, No. 12, pp. 407, 408*).—Statistical data are presented and discussed which show a gradual increase in the value of land from the beginning of the century to the years 1871–1875 when the maximum was reached. Regarding this period as 100, the decline in land values is thus shown: For 1876–1880, 96; 1881–1885, 86; 1886–1890, 77; 1891 1895, 70; and 1896–1900, 71. Comparative figures show a close correspondence between the value of land, tax rates, and the prices of agricultural products during the same periods.

Small holdings and allotments act, 1907 (*London: Gov't., 1907, pp. 28*).—This is the text of the law which became operative January 1, 1908, conferring authority on the county councils or the commissioners of the Board of Agriculture and Fisheries to acquire lands, either freely or compulsorily, for the use of small holdings.

Circular under the small holdings act, T. H. ELLIOTT (*Jour. Bd. Agr. [London], 14 (1908), No. 12, pp. 754–757*).—This circular by the Board of Agriculture and Fisheries summarizes the powers and duties of parish councils and chairmen of parish meetings regarding the acquisition, management, and control of land for small holdings in England and Wales under the provisions of the act of 1907.

The agricultural cooperative movement in France, M. LAIR (*Rev. Écon. Internat., 5 (1908), I, No. 1, pp. 62–106*).—This is a history of agricultural cooperation in France from its legal establishment in 1884 to the year 1906, with a discussion of its economic significance and prospects for future development. The cooperative societies in France numbered more than 4,000 in 1906.

The rural credit system of Prussia, H. Mauer (*Das Landschaftliche Kreditwesen Preussens. Strassburg, 1907, pp. 206*).—This is a contribution to the history of agricultural credit in Prussia from 1805 to 1905. An extensive bibliography is included.

The rural leagues in Italy, E. Brianza (*Riv. Internaz. Sci. Soc., 44 (1907), No. 176, pp. 546–559*).—This is a brief discussion of the organization and functions of the rural associations for the improvement of the farm laboring classes in Italy, the causes which gave rise to these leagues, and the results which have followed their organization. The economic and social conditions of farm laborers have been improved since these associations were formed.

The agricultural situation, E. Lahitte (*La Situacion Agricola. Buenos Ayres, 1907, pp. 23*).—The author discusses the prevailing agricultural conditions in Argentina, and presents a proposed law for the establishment of cooperative societies which carries a grant of $2,000,000 for the promotion of agricultural credit among farmers.

Agricultural credit, E. Lahitte (*El Crédito Agricola. Buenos Ayres, 1907, pp. 29*).—This pamphlet gives a brief review of the development of agricultural cooperative societies in various countries, shows the great need of credit on the part of farmers, and makes a plea for the passage of a law to promote cooperative societies and agricultural credit in Argentina.

The farm labor problem, E. von Graeve (*Illus. Landw. Ztg., 27 (1907), No. 104, pp. 893, 894*).—The author calls attention to the increasing difficulty of securing farm help and gives an outline of the plan carried out on his own estate for keeping his laborers on the land.

The system consists in granting holidays to the help during certain seasons of the year, when it will interfere least with the heavier and necessary duties of the farm, and other privileges as a free dwelling, garden, cow, wood, manure, etc. The estimated income of a married man on this basis is placed at 533 marks (about $128), and of a young person 219.50 marks. In addition a premium is paid to young workers according to age which at 20 equals 50 marks. When all items are taken into consideration, the farm hand is shown to be far better off than the ordinary factory hand in cities.

The agricultural labor problem, J. G. Mailáth (*Ztschr. Agrarpolitik, 6 (1908), No. 1, pp. 15–25*).—The author points out many differences between agriculture and other industries which directly or indirectly affect the question of labor. As means for improving the relations between master and man and of placing the agricultural industry on an independent economic basis, the author advocates the granting of a piece of land by the proprietor for the use of the laborer, the regulation of the tariff with regard to the exportation of agricultural products, and the appointment of an arbitration commission to settle farm labor disputes.

The wages of British agricultural laborers, B. Skalweit (*Mitt. Deut. Landw. Gesell., 23 (1908), Beilage No. 1, pp. 14, dgm. 1*).—Statistical data are presented and discussed as to the different kinds of farm help and their wages in the various counties of the United Kingdom from 1790 to 1900. The prices of the most important necessaries of life are also included, and their bearing on the improvement in the standard of living of farm laborers is pointed out.

Numbers engaged in the chief agricultural pursuits, 1870–1900 (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 5, pp. 35, 36*).—Census decade returns for the United States are presented and discussed.

In general the number of persons engaged in agricultural pursuits in 1870 was 5,919,857 and in 1900, 10,243,403. Compared with the total population for these years it shows an increase of 73 per cent in the number of persons engaged in agriculture, with 97 per cent increase in the general population.

study of the comparative figures of the main pursuits of the agricultural industry shows a similar decline. A point of interest, however, is "that the increase in the number of agricultural laborers from 1870 to 1900, inclusive, was only 52.8 per cent, against an increase of 73 per cent in the total number of persons engaged in the chief agricultural pursuits and an increase of 90.3 per cent in the number of farmers, planters, and overseers. If this is unsatisfactory from the point of view of the farmer who happens to be suffering for lack of needed help, it is gratifying to one whose pleasure is in the increase of the independent classes rather than in that of the classes dependent on wages."

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10* (*1908*), *No. 5, pp. 33–40*).—The usual data as to the condition of crops in the United States and foreign countries and the yields, value, and prices of agricultural products are discussed, together with an article on the numbers engaged in the chief agricultural pursuits, 1870–1900, noted above.

Statistical report of the Illinois State Board of Agriculture for December 1, 1907, E. E. McCoy (*Ill. Bd. Agr. Circ. 219, pp. 96*).—Statistical data of acreage, yields, and value of crops, number and value of live stock, and quantity and value of dairy and other products raised in the State in 1907. Of a total value of $280,666,020, corn heads the list with a value of $111,344,922.

Agricultural statistics, Ireland, 1907, W. G. S. Adams (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1907, pp. 44*).—Data are presented on the acreage in crops, the estimated yields, and the number and kind of live stock in each county of Ireland in 1907.

Land occupation, live stock, and agriculture in New Zealand, E. J. von Dadelszen (*New Zeal. Off. Yearbook 1907, pp. 384–410*).—Statistical data on the number and size of holdings, number and kinds of live stock, and acreage and yields of the principal crops in 1907 are tabulated in comparison with similar data for preceding years and discussed. Of a total of 72,338, holdings of the following size present the largest proportions: From 1 to 10 acres, 20,455; from 10 to 50 acres, 12,012; and from 100 to 200 acres, 10,251. The total of occupied land in 1907 was 37,408,473 acres.

AGRICULTURAL EDUCATION.

Notes on the history of agricultural pedagogy in the United States, A. C. True (*Proc. Soc. Prom. Agr. Sci., 28* (*1907*), *pp. 84–106*).—This paper, presented at the annual meeting of the Society for the Promotion of Agricultural Science held at Lansing, Mich., May 27, 1907, includes an account of the general development of pedagogical ideas in Europe and America from about the middle of the seventeenth century to the present time, and the history of agricultural pedagogics—the time during which agriculture has been taught in our schools, divided into four periods, viz, (1) the tentative period, from 1820–1857, when efforts were made to establish agricultural instruction in elementary public schools, private secondary schools, colleges under the head of agricultural chemistry, and State agricultural colleges; (2) the period of organization of agricultural colleges, from 1857–1880; (3) the experiment station period, from 1880–1895; and (4) the period of specialization and expansion, from 1895–1907.

History of collegiate education in agriculture, E. Davenport (*Proc. Soc. Prom. Agr. Sci., 28* (*1907*), *pp. 43–53*).—The writer deals especially with the various influences which led up to the legislation of 1862 known as the Land-grant Act or the first Morrill Act, and traces at some length the movement in Illinois under the leadership of Jonathan B. Turner, one of the early professors in Illinois College, at Jacksonville.

Annual report Winnebago County schools, 1907, O. J. KERN (*Rockford, Ill., 1907, pp. 96, figs. 109, dgms. 4*).—This report deals not only with the work of the superintendent during the past year in the schools of Winnebago County, Ill., but also with numerous suggestions for improving the schools.

In the first chapter, "What to do and how to do it," the writer gives numerous suggestions for beautifying school grounds. He shows illustrations of school buildings with unimproved surroundings and gives planting plans drawn to scale for the improvement of the grounds. There are four such plans, each representing a different type of schoolhouse and school grounds, and hence a different problem. In a chapter on "Some things done and otherwise," reports of progress from different teachers are given. Chapter 3 is taken up with industrial education, an educational campaign in behalf of trees, the education excursion to the Illinois College of Agriculture, and the work of the Winnebago County boys' and girls' clubs. Other chapters deal with libraries, school-room decoration, patriotism in the public schools, the Country School Teachers' Association of Illinois, statistics, points of school law, and consolidation. The John Swaney Consolidated School in Putnam County, Ill., is described at considerable length. This school includes in its course of study 3 courses in agronomy, 2 in animal husbandry, 1 in horticulture, 3 years of household science, and 1 year of manual training, all of which are elective.

Some experiments in elementary agriculture for the Auckland public schools (*Education: Manual and Technical Instruction. Wellington, New Zeal.: Gov't, 1907, pp. 56–64*).—These are simple school experiments intended to aid teachers in giving instruction in elementary agriculture. It is recommended that 1 hour a week be devoted to this work, giving one-third of the time to indoor experiments with plants, one-third to outdoor experiments with plants, and one-third to experiments with soils or milk or other phases of agriculture. Twelve exercises relating to germination are given for indoor work during the first year, and 12 exercises dealing with seedlings for the second year's work. The outdoor experiments are to be conducted in the school garden, and relate to tillage, manures, commercial fertilizers, and the cultivation of particular crops, such as potatoes. Ten experiments with soils are outlined, and 11 with milk. Lists of apparatus and material necessary for these exercises are given.

Experiments in nature study for teachers in the Wellington education district (*Education: Manual and Technical Instruction. Wellington, New Zeal.: Gov't, 1907, pp. 64–69*).—A large number of simple experiments relating to the following topics are given: Composition of air and water, experiments with hydrogen, ammonia, starch and sugar, germinating seeds, roots, stems, leaves, flowers, and fruits.

Beautifying school grounds, W. A. HENRY (*Wis. Jour. Ed., 40 (1908), No. 1, pp. 9, 10*).—Suggestions for tree and shrub nurseries in connection with county normal training schools.

Domestic science, its growth and influence, HETTIE M. ANTHONY (*Trans. Ill. Hort. Soc., n. ser., 40 (1906), pp. 144–150*).—This is a paper on the introduction, growth, and influence of instruction in domestic science presented at the annual convention of the Illinois State Horticultural Society held at the University of Illinois, December 12–14, 1906.

Home nature-study course, ANNA B. COMSTOCK and J. W. SPENCER (*Home Nature-Study Course* [*Cornell Univ., State Col. Agr.*], *n. ser., 4 (1908), No. 3, pp. 24, figs. 9*).—Suggestions are given for winter work of third-year pupils as outlined in the Syllabus of Nature Study and Agriculture, issued by the New York State Education Department. There are 2 lessons on the raccoon, 3 on the downy woodpecker, 1 on the hairy woodpecker, 3 on snakes, including the garter or garden, milk, and common or banded water snakes, 3 on the onion, 1 each on the snowdrop and crocus, and 3 on the hemlock. A list of books referred to in the lessons of the home nature-study course, 1907–8, is appended.

[Lessons in elementary agriculture] (*Cornell [Univ., State Col. Agr.], Rural School Leaflet, 1 (1908), No. 5, pp. 65–76, figs. 6*).—This number contains, in addition to a foreword to the teacher on the use of the leaflet, the following lessons: Proportions of a Horse, by M. W. Harper; Plant Food, by G. F. Warren; Practical Exercises on Feathers, by J. E. Rice; Lessons in Dairying and Some New York Dairy Statistics, by R. A. Pearson.

An elementary laboratory study in crops, J. A. Jeffery (*Mich. State Supt. Pub. Instr. Bul. 26, pp. 28, figs. 8*).—This is a series of 15 crop studies prepared by the professor of agronomy at the Michigan Agricultural College for use in the public schools in connection with a text-book. The exercises begin with studies of germination, and are followed by studies of seedlings, food stored in seeds, depth of planting, vitality of seed as affected by age, temperature, etc., and practical means of testing seed corn. The lessons are accompanied by directions for judging corn and a score card.

An elementary laboratory study in soils for the schools of Michigan, J. A. Jeffery (*Mich. State Supt. Pub. Instr. Bul. 27, pp. 36, figs. 12*).—This bulletin is intended for pupils in the public schools and the exercises are outlined with a view to enabling the pupil to acquire experimental knowledge of the bearing of the study of soils upon farm practice and to illustrate or confirm knowledge gained through text-books or observation. The exercises are intended to illustrate specific gravity of soils, pore space in soils, their weight, water-holding power, moisture losses, the effects of mulches, puddling, organic matter and sandy material in soils upon retention of moisture, and the temperature of soils.

The soil: With reference to fertility and moisture, J. T. Willard (*Industrialist, Agr. Ed. Ser., 1 (1908), No. 1, pp. 15, fig. 1*).—This is the first of a series of pamphlets intended for the teachers of Kansas to give the work of agricultural education a scientific basis. The soil is discussed with particular reference to fertility and moisture, and some attention is given to the origin and formation of soils, kinds of soil, the chemical elements of fertility, the maintenance of fertility, humus, nitrification, soil water, and dry farming.

How plants feed and grow (*Industrialist, Agr. Ed. Ser., 1 (1908), No. 2, pp. 32*).—This subject is discussed in two parts. (1) How plants feed, by J. T. Willard, deals with the absorption and use of water in plants and the sources and uses of carbon, oxygen, nitrogen, and mineral matter. (2) How plants grow, by G. F. Freeman, discusses the seed and its parts, germination, growth, the functions of stem, buds and flowers, the fertilization of flowers, the production of fruit, and vegetative reproduction.

Tree culture, A. Dickens (*Industrialist, Agr. Ed. Ser., 1 (1908), No. 4, pp. 79, figs. 12, dgm. 1*).—This number of the agricultural education series is devoted to farm forestry, dealing with the effect of trees on soil and climate, the value of trees, utilizing waste lands by growing trees upon them, the use of trees for shade and ornament, and notes on the best deciduous species to use for fuel, posts, and general planting, evergreens, fruit trees, the preparation of soil, propagation of forest trees from seeds, buds, cuttings, and grafts, transplanting, pruning, spraying, and cultivation.

Outline of a course of study and reading on types and breeds of farm animals, C. S. Plumb (*Ohio State Grange Ed. Bul. [3], pp. 6–9*).—A course of study prepared for members of the Ohio State Grange, consisting of 15 lessons based on Types and Breeds of Farm Animals by the author.

The horse, F. R. MARSHALL (*Agr. Col. Ext. Bul. [Ohio State Univ.], 3 (1908), No. 5, pp. 4–8, figs. 5*).—A brief elementary discussion of the points of a good horse.

Swine, G. C. WHEELER (*Industrialist, Farmers' Inst. Ser., 1 (1907), No. 1, pp. 61, figs. 14*).—This is the first of a farmers' institute series of articles on important farm topics. It deals with the history, breeds, feeding, care and management of swine, swine registers and score cards for fat hogs and for bacon hogs.

Farm dairying, D. M. WILSON (*Industrialist, Farmers' Inst. Ser., 1 (1907), No. 2, pp. 97, figs. 7*).—This article deals with the breeds of dairy cows, their feeding, care, and management, and the marketing of milk for the city trade.

Kentucky State Farmers' Institute (*Off. Rpt. Ky. State Farmers' Inst., 2 (1907), pp. 204, figs 9, dgm. 1*).—This includes the proceedings, addresses and lectures of the Kentucky State Farmers' Institute at the second annual meeting held at Shelbyville, February 26–28, 1907, under the auspices of the State Department of Agriculture.

MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1907 (U. S. Dept. Agr. *Rpts. 1907, pp. 811*).—This is made up of the reports of the Secretary and heads of Bureaus. The various reports are also issued as separates.

Report of the Secretary of Agriculture, 1907, JAMES WILSON (*U. S. Dept. Agr. Rpt. 85, pp. 100*).—A general review of the work of this Department during the fiscal year ended June 30, 1907, and reprinted from the publication noted above.

Twentieth Annual Report of Alabama College Station, 1907 (*Alabama Col. Sta. Rpt. 1907, pp. 38*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1907, and reports of the director and heads of departments covering the work of the station during the year.

Annual report of the director for the fiscal year ending June 30, 1907 (*Delaware Sta. Bul. 80, pp. 16*).—This contains the organization list of the station, the report of the director on the work, personnel, equipment, and needs of the station, a financial statement for the fiscal year ended June 30, 1907, and a list of the bulletins available for distribution.

Twentieth Annual Report of Louisiana Stations, 1907 (*Louisiana Stas. Rpt. 1907, pp. 32*).—This contains the organization list, reports on the work at the Sugar Station at Audubon Park, the State Station at Baton Rouge, and the North Louisiana Station at Calhoun, a summary of analyses of fertilizers, feeding stuffs, Paris green, and miscellaneous materials, a brief synopsis of the work of the State geological survey, and a financial statement for the fiscal year ended June 30, 1907.

Fifteenth Annual Report of Minnesota Station, 1907 (*Minnesota Sta. Rpt. 1907, pp. XLII+256*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1907, a list of the bulletins published during the year, the report of the director including summaries of the work of the different divisions and of the Northwest and Northeast experimental farms, a study of certain cathartics, abstracted on p. 1085 of this issue, and reprints of Bulletins 97–101.

Annual Report of New Jersey Stations, 1907 (*New Jersey Stas. Rpt. 1907, pp. XXIV+560*).—This includes the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1907, and for the College Station for the fiscal year ended June 30, 1907, a report of the director reviewing different lines of station work, brief notes on meteorological data for the year, and departmental reports abstracted elsewhere in this issue. A report on the inspection of feeding stuffs has been previously noted (E. S. R., 19, p. 66), as has also one on the inspection of Paris green (E. S. R., 19, p. 558).

Annual Report of South Dakota Station, 1906 (*South Dakota Sta. Rpt. 1906, pp. 5–17*).—This is a report of the director of the station, including a financial statement for the fiscal year ended June 30, 1906, and a synopsis of the publications of the year, supplemented by reports of the different departments.

Annual Report of South Dakota Station, 1907 (*South Dakota Sta. Rpt. 1907, pp. 7–28*).—Data corresponding to the above are reported for the fiscal year ended June 30, 1907, together with a list of the exchanges of the station.

Index (*Hawaiian Sugar Planters' Sta., Div. Ent. [Pamphlet], pp. 4*).—An index to Volume 2, comprising Bulletins 2–5.

Experiment Station Work, XLVI (*U. S. Dept. Agr., Farmers' Bul. 320, pp. 32*).—This number contains articles on the following subjects: Fish fertilizer, reclamation of salt marshes, Bermuda hay, protein content of forage crops, quality in wheat, potato spraying, anesthetics in forcing plants, fattening cattle for market, cotton-seed meal and corn silage for cows, carbonated milk, and preservation of fence posts.

Report of the Bureau of Agriculture for the fiscal year ending June 30, 1907 (*Philippine Agr. Rev., 1 (1908), No. 1, pp. 6–64, pls. 14*).—A progress report of the administrative, plant industry, and animal industry divisions of the Philippine Bureau of Agriculture.

Report on agricultural investigations in Prussia during the years 1901 to 1905, H. Neubauer et al. (*Landw. Jahrb., 37 (1908), Sup. 1, pp. XI + 287*).—This report explains in some detail the system of agricultural research in Prussia and describes the various lines of scientific and practical work of the various experiment stations and other research institutions.

NOTES.

Alabama College and Station.—A more complete differentiation in organization has been brought about by the establishment of the positions of deans of the faculties of academic departments, engineering and mines, and agricultural science, B. B. Ross being appointed to the position last named. An assistantship in animal pathology and bacteriology has been established. Recent promotions include those of D. T. Gray to professor of animal industry and L. N. Duncan to assistant professor of agriculture. C. LeR. Hare has been made professor of physical and physiological chemistry and R. S. Mackintosh professor of horticulture and forestry. C. M. Floyd has resigned as farm superintendent and is succeeded by E. F. Cauthen, who will also act as recorder in the station. I. S. McAdory has been appointed assistant in veterinary science and W. F. Turner, a graduate of the Massachusetts College, assistant in entomology.

California University.—The summer school, which opened June 22, includes courses in forestry, under Findley Burns, of the Forest Service, and agriculture, under Leroy Anderson, of the university, and Riley Oren Johnson, of the Chico State Normal School.

Georgia College.—A better-farming special was sent out this spring for a 34-day trip, covering the entire State. The train was visited by over 150,000 people, the attendance in some places reaching 5,000. The subjects discussed included seed selection, fertilizers, care of live stock, orchards, gardening and truck growing, insects, plant diseases, handling and utilizing cotton products, management of farm lands, and agricultural education.

Hawaii College.—Press reports announce the election of J. W. Gilmore, of the Pennsylvania Station, as president.

Idaho University.—The Agricultural Club has established the *Idaho Student Farmer* as a quarterly. Dr. C. A. Peters, professor of chemistry, has been given leave of absence for one year, which is to be spent in study in Berlin.

Indiana Station.—Walter P. Kelley has resigned as assistant in soil improvement to accept an appointment as expert in soil improvement in the Hawaii Station.

Iowa College and Station—G. L. McKay has resigned as dairyman to become secretary of the National Dairy Manufacturers' Association. Recent promotions include those of M. L. Bowman to professor and H. G. Bell and B. W. Crossley to assistant professors of farm crops, and of H. C. Pierce to assistant professor of animal husbandry in charge of the poultry department.

Kansas College and Station.—According to press reports teachers' courses in domestic science and agriculture were opened May 19, the domestic science course to continue for 10 weeks and the agricultural course for 6 weeks. Mrs. Dalinda Cotey, formerly of the Utah College, has been appointed professor of domestic science, vice Mrs. Henrietta W. Calvin, resigned to accept the professorship of household economics at Purdue University. A. L. Peck, assistant horticulturist, has accepted the instructorship in landscape gardening at the Oregon College.

Kentucky Station.—T. R. Bryant has been appointed assistant in animal husbandry and E. J. Kinney assistant in entomology and botany.

Louisiana University and Stations.—H. L. Shantz has resigned as professor of botany to accept a position with the Bureau of Plant Industry of this Department. W. P. Naquin, assistant sugar chemist, has resigned to engage in commercial work, and has been succeeded by Benjamin F. Hochenedel. Other appointments include, at Baton Rouge, R. G. Fuller, formerly assistant in chemistry at the university, as assistant chemist, and at Calhoun, Bruce Anderson as dairyman and the reappointment, after a year's absence in commercial work, of E. J. Watson as horticulturist.

Maine University and Station.—At the recent commencement the degree of D. Sc. was conferred on L. H. Merrill, who retired from station work July 1 to become professor of biological and agricultural chemistry in the university. Dr. Charles E. Lewis, instructor in botany in the University of Wisconsin, has been appointed associate vegetable pathologist, and Miss Maynie R. Curtis, a postgraduate student at the University of Michigan, has been appointed assistant biologist.

The cornerstone of the new agricultural building was laid June 10 in connection with the commencement exercises. The programme included brief addresses by President Fellows, Dean Hurd, Director Jordan of the New York State Station, State Superintendent of Public Schools Payson Smith, and State Commissioner of Agriculture A. W. Gilman. A substantial red brick structure of three stories and high basement is planned, to cost about $50,000. It is hoped the building will be ready for occupancy during the next college year.

Maryland College.—The college has purchased a railway car for traveling school work and fitted it up into living quarters for the instruction staff, and a lecture room equipped with a blackboard, stereopticon, and other apparatus. A month's trip made during May, with stops of about three days in a place, and forenoon and evening sessions of two hours' each, brought out a good attendance in most localities.

Massachusetts College and Station.—A reorganization of the instruction in agriculture has been effected by the establishment of a division of agriculture to include for the present departments of animal husbandry, agronomy, dairying, and farm administration. J. A. Foord, associate professor of agronomy, has been made acting head of the division of agriculture and professor of farm administration, the duties of the latter position including the management of the college farm. A department of hygiene and physical culture has been established in charge of Percy L. Reynolds, M. D. R. D. MacLaurin, of the station, will also act as lecturer in organic chemistry in the college. B. F. Jenks has been appointed instructor in agricultural education, a part of his duties to consist of instruction in agriculture in the North Adams State Normal School. The formal organization of a graduate school is announced, with Prof. C. H. Fernald as dean.

A high-school day was held May 15, at which the senior classes of near-by high schools were invited to visit the college and look into its work. About 140 pupils, representing 8 high schools, were in attendance, accompanied by teachers and in some cases by school officials. It is planned to make this an annual occasion. The initial registration in the summer school of agriculture was 153, mainly teachers, but including many desiring general information on agriculture and nature-study topics.

Minnesota University and Station.—James T. Wyman, Daniel R. Noyes, and S. G. Comstock, of the board of regents, have been succeeded by John Lind and C. A. Smith, of Minneapolis, and Henry B. Hovland, of Duluth. E. M. Freeman, of the Bureau of Plant Industry of this Department, has been appointed professor of botany and plant pathologist; Edward K. Slater, State dairy and food commissioner, assistant professor of dairy husbandry, and J. T. Stewart, of the drainage investigations of this Office, professor of agricultural engineering and physics. James A. Bull, who was prominent in the establishment of the school of agriculture, died April 27, aged 74 years.

A summer school for teachers is being held for the first time, its object being instruction in the simpler agricultural subjects, with a view to their introduction in rural schools.

Missouri University and Station.—Frank G. King, assistant in animal husbandry, has resigned to accept a position with the State board of agriculture; E. H. Favor, instructor in horticulture, has resigned to accept the assistant professorship of horticulture and botany at the Utah College. Joseph R. Keithley, a recent graduate of the university, has been appointed assistant in dairy husbandry.

Contracts have been let for the erection of the new agricultural building and a cold-storage and ice-making plant. The agricultural building is to be located on the horticultural grounds one block from the main campus of the university. It will be 260 feet long and will consist of two stories and a high basement. It is to be constructed of native limestone, thoroughly fireproof throughout, with interior finish of oak, and will cost about $100,000. In addition to the administrative offices of the college of agriculture and of the station, the agricultural library and a commodious reading room, the building will provide laboratories and class rooms for the departments of agronomy and animal husbandry. It will also be used as the headquarters of the State board of agriculture, the State highway commissioner, the State veterinarian, the State dairy and food commissioner, and the State soil survey.

The building will contain an auditorium with a seating capacity of abut 500, and with facilities for live stock, dairy, meat, or other demonstrations for use in connection with the farmers' conventions and similar gatherings at the college, and in the basement there will be a large room especially designed for poultry, corn, and dairy shows. It is expected to complete the building by March 1, 1909.

The cold-storage and ice-making plant is to be installed in connection with the dairy building, and will contain rooms of sufficient size to permit of experiments in the storage of butter and other dairy products. It will also be utilized in the handling of the dressed meats of the animals studied in connection with the nutrition investigations under the Adams Act.

Nebraska University and Station.—Extensive improvements are in progress on the station grounds, including the removal of the veterinary clinic laboratory and its replacement by a new building to cost $12,500, and plans are being drawn for a plant industry building, to cost from $80,000 to $100,000. A. F. Magdanz, assistant in animal husbandry, and F. E. Denny, assistant in horticulture, have resigned to engage in commercial work, and Miss Stella A. Hartzell, assistant in agricultural chemistry, has resigned to accept a similar position at the Iowa College. E. M. Wilcox, of the Alabama College and Station, has been elected professor of agricultural botany and botanist of the station, and will begin work September 1, in succession to F. D. Heald, whose resignation has been previously noted.

New Hampshire College and Station.—President W. D. Gibbs received the degree of D. Sc. from the University of Maine at its recent commencement. H. F. Hall has resigned as horticulturist and C. S. Spooner as assistant entomologist, and they have been succeeded respectively by B. S. Pickett, of the Illinois University and Station, and C. F. Jackson, of the University of Ohio. Other appointments include W. H. Wicks, formerly of the Oregon Station and recently a graduate student at Cornell University, as assistant horticulturist; I. M. Lewis, of the University of Indiana, as assistant in botany; J. C. McNutt as herdsman, and David Lumsden as assistant in floriculture.

New Jersey College and Stations.—K. C. Davis, dean of the school of agriculture of St. Lawrence University, has been elected associate professor of agriculture and principal of the agricultural school, his services to begin with the opening of the college year. F. C. Minkler, animal husbandman of the station and instructor in the short courses, has been elected instructor in animal husbandry, and Clarence L. Pfersch, of this year's graduating class, has been appointed assistant chemist.

New York State Station.—An appropriation of $32,500 has been granted by the legislature for the erection of an auditorium.

North Carolina State Station.—W. J. Hartman, a graduate of the Ontario Agricultural College and of the Chicago Veterinary College, has been appointed assistant veterinarian, and Z. P. Metcalf, of the Michigan College and Station, has been appointed assistant entomologist.

North Carolina College.—The Rural Science Club has established the *North Carolina Student Farmer*, which is to be published monthly during the college year.

Ohio Station.—H. S. Woods has resigned as assistant in nutrition investigations and A. C. Whittier, of the Maine Station, has been appointed to the position. E. W. Gaither and L. T. Bowser have been appointed assistant chemists.

South Carolina College and Station.—Dr. E. Barnett, assistant in veterinary science in the college, has been transferred to the station as animal husbandman and veterinarian.

Vermont University.—A summer school for district superintendents was held during the week of July 13, following the session of the American Institute of Instruction, for the consideration of agricultural instruction in secondary schools. The school was under the joint auspices of the State department of education and the university. The instruction staff included Professors Jones, Beach, and Hills of the university, and President Butterfield and Professor Hart of the Massachusetts College.

Ontario Agricultural College.—A farm mechanics building and an addition to the chemical laboratory have been completed, and an addition to the dormitory is in process of erection.

Experimentation with Denatured Alcohol.—The Commissioner of Internal Revenue has recently exempted agricultural experimental distilleries from the provisions of the internal-revenue laws relating to the manufacture of alcohol, and it is expected that this will facilitate experimentation with this material at the experiment stations and elsewhere. The Bureau of Chemistry of this Department has extended an invitation to each experiment station to send a representative to Washington during the summer for instruction in the methods of manufacture and other phases of the subject.

New Agricultural Schools in New York.—The New York State legislature has appropriated $80,000 for the establishment and maintenance of an agricultural school in connection with Alfred University, Alfred, N. Y. Of this sum $5,000 is to be used for maintenance the first year, after which the regular maintenance fund will be $10,000. The school has a farm of 200 acres, and will be provided with a new main building costing $30,000, a barn costing $10,000, a dairy and creamery, and a small greenhouse. The dedication of the new school took place June 10, among the speakers being Dean Bailey, of Cornell University, who was subsequently given the degree of LL. D. Press reports state that John McLennan, of Syracuse, N. Y., an Alfred alumnus, has been appointed professor of agriculture and farm superintendent.

An appropriation of $20,000 was also granted for the establishment of an agricultural school of secondary grade at Morrisville.

The charter under which the agricultural school at St. Lawrence University was established has been so amended as to restrict the instruction to elementary and practical courses to be given only at the university.

New Agricultural High School Building in New England.—A new building for the first industrial and agricultural high school in New England was dedicated May 22 at Petersham, Mass. Among the speakers were Presidents Eliot of Harvard, Carroll D. Wright of Clark College, and Butterfield of Massachusetts Agricultural College, and Secretary George H. Martin of the State board of education.

Agricultural Education in the Province of Quebec.—The annual report of the Minister of Agriculture of the Province of Quebec contains reports of the work during 1906–7 of the agricultural schools at Ste. Anne de la Pocatiere and Oka, the housekeeping schools at Roberval and St. Paschal, the Provincial Dairy School at St. Hyacinthe, the Laval Veterinary School at Montreal, and of the work in horticulture in the primary schools. The Agricultural School at Oka is being converted into an agricultural institute to be affiliated with Laval University, and the government has considerably increased the grant to this school to enable it thus to raise its teaching to a higher plane. The number of pupils in primary schools receiving voluntary instruction in horticulture increased from 425 in 1906 to 1,258 in 1907.

Agricultural Instruction Abroad.—Studley College, Warwickshire, England, has added to its curriculum a housewife's course, which may be taken either separately or in conjunction with dairying and poultry keeping, which go to make up the colonial training course. The instruction leads to a certificate and will include training during three terms in cooking, laundering, and housework, together with lectures on sick nursing, first aid, theory of education, and household management.

A recent number of *La Semaine Agricole* contains a description of the work of an organization founded by Julien Ray, of the University of Lyon, France, for the purpose of providing instruction in agriculture for soldiers and farmers at the garrison in Lyon. In each regiment one lecture a week is delivered by a specialist, who speaks on some phase of one of the following topics: The human body, the soil, the plant, and economic methods of culture. There are also lectures for mechanics. This work was started in 1904, and in the main those attending the lectures have manifested great interest in the work.

Illustrierte Landwirtschaftliche Zeitung of February 15 states that the Association of Rural Household Economy will soon open its fourth household economy school at Scherpingen, near Sobbowitz, in West Prussia. The curriculum will extend through one year and will include advanced courses in dairying, poultry husbandry, and horticulture. Of the three other schools, located at Reifenstein, Obernkirchen, and Maidburg, those at Obernkirchen and Maidburg give training courses to pupils desiring to become teachers of household economy, and that at Maidburg also offers a course in farm management and advanced courses similar to those contemplated at Scherpingen.

A recent issue of *Die Gartenwelt* gives a brief description of the horticultural winter school opened at Elmshorn in 1907 under the direction of Dr. Ludwig Rabe. The school was founded by the Association of Commercial Horticulturists of Germany, and receives additional aid from the State, the District Pomological Society of Pinneberg, and the Chamber of Agriculture of Schleswig-Holstein. It is the first elementary horticultural school to be devoted especially to commercial horticulture. The course will extend through two winter terms, from December 1 to March 1, the first year's work including soils, drawing, surveying, horticultural plant production with special attention to the nursery industry and pomology, forestry, and chemistry in its relation to fertilizers and plant production, while the second year includes in addition fertilizers, bookkeeping, and plant diseases.

The German Agricultural Society.—This society is the largest organization of its kind in the world. It has a membership of about 15,000 and has a wide range of activities not only in experimental work and in the dissemination of agricultural information, but in the purchase and inspection of supplies. For example, it has fertilizer, feeding stuffs, and seed departments through which members can purchase their supplies of these articles and have their quality guaranteed. A recent report of the society shows that during the year 1907 members bought through the society some 373,150 tons of fertilizing materials. Analyses of the feeding stuffs and fertilizers are made by the agricultural experiment stations free of cost to the members under an arrangement by which the manufacturers pay the stations for the analytical work. During the past year 3,936 analyses of fertilizers were made under this arrangement, of which 3,490 were found to be up to the guaranteed quality, and 446, or 11.13 per cent, were found to be too low. The largest purchases through the society were of potash salts, 260,000 tons, the next largest of Thomas slag, 74,000 tons, followed by lime, 23,000 tons, and smaller amounts of superphosphates and superphosphate mixtures, nitrate of soda, bone meal, and calcium cyanamid.

New Journals.—*The Philippine Agricultural Review* is a monthly publication which is being issued in both English and Spanish editions by the Bureau of Agriculture for free circulation in the Philippine Islands. It is intended to replace the press bulletins previously issued, and will be nontechnical in scope. The initial number is devoted entirely to the annual report of the Bureau for the fiscal year ended June 30, 1907, but succeeding numbers will contain a series of articles on various phases of general agriculture.

Archiv fur Zellforschung is being published at irregular intervals by R. Goldschmidt, of München, as a purely scientific journal, devoted to researches on cytology.

The Indian Forest Department has decided to discontinue its series of forest bulletins and to issue in its stead two new series of publications, *Indian Forest Memoirs* and *Indian Forest Records*. It is stated that the Memoirs are to be strictly technical in scope and will be limited to the publication of complete and important monographs on special subjects, being open for this purpose to all papers having a scientific or economic bearing on Indian forestry. They will be issued at irregular intervals, in quarto size, each issue consisting of one or more papers, and bound in volumes of about 300 pages. The Records will be made up of from 60 to 70 pages per part, as occasion demands, and will be devoted to the publication of papers giving the results of the investigations of the research department or of others, together with brief notes and observations of current interest. The initial number of the Records consists simply of a paper entitled A Note on the Lac Insect (*Tachardia lacca*), its Life History, Propagation, and Collection.

Journal of the American Peat Society is being issued as a quarterly. Various phases of the peat industry in this country are to be taken up, including the drainage of peat lands and the agricultural uses of peat, the latter being assigned to H. D. Haskins, of the Massachusetts Station.

Boletim do Instituto Agronomico has been established by the director of the Agronomique Institute of São Paulo, Brazil, under the direction of the Secretary of Agriculture, Commerce and Public Works, as a monthly record of the work of the institute, together with other data. The initial number includes an account of its work during October and November, 1907, articles on the value of chemical analysis of soils and on lime nitrogen, an agricultural calendar, and a meteorological summary for the year.

Revista do Museu Municipal de Iguape is being issued by the Municipal Chamber of Iguape, at São Paulo, Brazil. The initial number includes articles on the conditions and resources of São Paulo, with data as to the agricultural products, fauna, flora, and minerals, meteorological observations at Iguape, etc.

A monthly, *The Jewish Farmer*, is being published in the Yiddish language by the Jewish Agricultural and Industrial Aid Society for the special use of Jewish immigrants.

Beginning with volume 18, *Zeitschrift für Pflanzenkrankheiten* has begun the issuing of a supplement known as *Internationaler phytopathologischer Dienst*. This publication will be devoted to the more practical accounts of investigations of plant diseases and means for their control, while the more technical papers will be printed as formerly in *Zeitschrift für Pflanzenkrankheiten*.

Revue Pratique des Abattoirs et de l'Inspection des Viandes et Comestibles is a monthly devoted to the construction and operation of abattoirs and cold storage plants, the legal and sanitary phases of foods and food inspection, the production of dressed beef and pork, and the utilization of the by-products.

Necrology.—Pierre Jacques Antoine Béchamp died April 15, aged 92 years. His work ranged over nearly every department of chemistry, but was especially directed toward biological chemistry, and notably fermentation. His chief works include Microzymes et microbes, origin des ferments (1866), and Les Microzymas dans leur rapports avec l'hétérogenie, l'histogenie, la physiologie et la pathologie (1883).

A recent number of *Deutsche Landwirtschaftliche Presse* notes the death of A. Wölbling at Berlin, May 9, in his sixty-eighth year. He was active as an officer of the German Agricultural Society from its beginning in 1885, and as an associate of Eyth's was instrumental in bringing about its present organization. Since 1896 he had been the general business manager of the society.

Miscellaneous.—*Cornell Countryman* for May contains a symposium on agricultural investigation, with papers as follows: Agricultural Investigation and the Adams Act, E. W. Allen; Experiment and Research, L. H. Bailey; Research Under the Adams Act, H. J. Webber; What is Research? T. F. Hunt.

The legislature of West Virginia has passed a law requiring elementary agriculture to be taught in the public schools.

Charles E. Chambliss, State entomologist of South Carolina, has accepted a position as expert in charge of rice investigations of the Bureau of Plant Industry of this Department.

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EXPERIMENT STATION RECORD.

VOL. XIX. AUGUST, 1908. NO. 12.

The third session of the Graduate School of Agriculture, held at Ithaca and Geneva, New York, July 6–31, continued and in many respects surpassed the notable successes of the sessions of 1902 and 1906. A combination of favorable circumstances, such as an extension of the scope of the school to include additional courses and advanced lines of work, the supplementing of the instruction corps as drawn from the staffs of American agricultural institutions by the securing of a number of lecturers of international reputation, and the increasing realization by agricultural workers, through the practical operations of the Adams Act and other agencies of agricultural progress, of the substantial benefits to be derived from such a school, resulted in a record-breaking enrollment and a session of unusual interest and importance.

The general plan of organization of the school was that followed at the previous session, the Association of American Agricultural Colleges and Experiment Stations, through its standing committee on graduate study, standing sponsor for the school, and the colleges represented in the association contributing to its support. Following the generous invitation of Cornell University and the New York Agricultural Experiment Station, arrangements were made to hold the school under their auspices. The lectures and seminars were held at the splendid new buildings of the college of agriculture, with a day's excursion to the experiment station at Geneva. To the efforts of the personnel of these institutions and the exceedingly well adapted facilities which were put at the disposal of the school, a large measure of its success should be attributed. Dr. A. C. True, Director of the Office of Experiment Stations, United States Department of Agriculture, served as dean, as at the previous sessions, and Prof. G. N. Lauman, of the college of agriculture, acted as registrar. At the close of the session resolutions were adopted by the students of the school expressing their appreciation and gratitude to the officers of the school and the institutions represented by them for their many attentions and courtesies.

The total enrollment of students at the close of the school was 164, of whom 15 were registered in the Graduate School of Home Economics, which was in session at the college of agriculture July 13–24, and conducted in close affiliation with the Graduate School of Agriculture. This enrollment was a material increase over the previous sessions, 75 students being registered in 1902 and 131 in 1906. The school was an even more representative body, with students from 37 States and the District of Columbia, in addition to 9 students from Canada, 2 from China, and 4 from India. The character of the school as an institution for advanced study was also clearly apparent, more than two-thirds of the students occupying positions in the agricultural colleges and experiment stations, including at least forty heads of departments. The membership was further augmented by the instruction corps of 78 to a total of 242. If to this be added the large number of visitors in attendance at the various conferences held during the session, it may be safely estimated that at least 350 persons came into direct association with the school. In the words of Dean True at the closing meeting, "probably never before had there been gathered together for so extended a period so large and enthusiastic a body of scientific men interested in agriculture."

The public opening exercises of the school were held on the evening of July 8 in the auditorium of the college of agriculture and were numerously attended by members of the university community, teachers in attendance at the summer session of the university, and members of the graduate school.

Addresses of welcome were made by President J. G. Schurman on behalf of Cornell University and Director W. H. Jordan on behalf of the New York Agricultural Experiment Station. In the opinion of Director Jordan the present session of the graduate school was especially important because our agricultural colleges and experiment stations, having passed through a period when their material equipment and resources were greatly enlarged and strengthened, are now giving much greater attention to the character of their personnel. A great demand for better trained men has therefore arisen, and it is the province of this school to encourage and stimulate the more thorough training of agricultural teachers and investigators.

President J. L. Snyder, of the Michigan Agricultural College, as president of the Association of American Agricultural Colleges and Experiment Stations, responded to the addresses of welcome on behalf of the association and spoke briefly of the relations of the association to the graduate school. He also emphasized the importance of good teaching in the agricultural colleges and the need that the agricultural specialists employed as teachers should study pedagogy and adapt their instruction to the requirements of different grades of students. In a broader way he urged all teachers, whether in school or college, to consider the fundamental importance of agriculture as providing for the general welfare of the people.

Director L. H. Bailey, as chairman of the committee on graduate study, spoke on the character of graduate study in agriculture and the degrees to be given for agricultural courses. He attributed the late development of graduate study to the fact that until recently agricultural knowledge has not been well organized, and there have been no recognized standards for postgraduate work as there have been for undergraduate work.

In his opinion, graduate work is the normal and natural work of a university as distinguished from a college, and needs to be definitely recognized as such and to be organized. It should tend to systematize all educational effort and to establish relationships between the different phases of educational work.

In regard to the character of postgraduate work, he placed the first emphasis on its content. It should be personal work and must be pursued largely alone with the minimum of the ordinary teacher's helps. It should be really postgraduate in its character and not merely additional undergraduate work, as is often the case. It is now becoming necessary to select the men who are worthy to undertake it, as not every man who has the technical or formal baccalaureate requirements has a postgraduate mind. Most men would better not ask for a masterate, and only now and then may one apply for a doctorate.

He went on to say that in the agricultual colleges it is necessary to make the postgraduate work dynamic. One may study so long as to get out of touch with the activities of life, and a result of our general educational systems is to make the student passive. We do not train for leadership. Students do not seem to have the power to apply themselves to the problems of life when they go home. In the colleges of agriculture we are trying to change all this, and it is quite as necessary to carry this spirit through the postgraduate as through the undergraduate work.

With reference to the specific degrees to be conferred, the speaker reaffirmed his belief that simplification is needed, and that it is unwise to make separate degrees for agriculture, preferring the earning of the well established degrees already recognized by the fellowship of educated men. The only degrees in course in his opinion should be the Ph. D., M. S., and B. S. (or M. A. and B. A.)

Dean True, of the graduate school, gave a brief history of the enterprise, and summarized some of the causes which are operating to increase the desirability of graduate study in agriculture. He called attention to the large increase in both National and State funds for agricultural education, research, and inspection since the previous session of the graduate school, and to the unprecedented demand for trained men to fill positions as teachers and investigators. So short is the supply that much competition for men with successful experience has arisen. Salaries have generally risen—whereas $1,800 to $2,000 was considered a good salary for a professor a few years ago, from $2,500 to $3,000 is now quite common. The initial salaries of 90 graduates of agricultural colleges in 1907, reported from 33 States, ranged from $500 (a kind of fellowship) to $1,700, and averaged $950. Those of 9 men with master's degrees averaged $1,200, and of 5 with doctor's degrees $1,300.

He showed that the White House Conference on the Conservation of our Natural Resources had brought out the need of a host of agricultural experts to solve the problem of the soil and the crops and to teach the results to the masses of our rural population.

"The paramount need of the time is an adequate supply of thoroughly trained leaders in this cause. It is true we need well-equipped men all along the line. But in the higher realms of research, college and university education, and broad organization for the promotion of agriculture we need a large number of men with much more training than is ordinarily given in the agricultural college. Without these leaders the real advance of our agricultural interests will be slow and halting.

"We must develop a class of real agricultural scholars and thinkers—men who will find the satisfaction of their lives in the discovery of new truth and in pointing out the paths of real progress for their fellowmen—men who will stick to their tasks and do good work in higher research and education regardless of commercial inducements or the applause given to more popular leaders. It is to aid in the discovery and encouragement of such men that this Graduate School of Agriculture has especially been established and it is hoped that even in the few days devoted to this present session much will be done to this end."

The courses of study offered by the school embraced seven main lines: Biochemistry, agronomy, horticulture, entomology, dairy husbandry and dairying, poultry, and veterinary medicine. The instruction took the form of both lectures and seminars, the programme being so arranged as to afford opportunity for attendance upon a number of these lines, and thereby permitting of extensive correlation of work. Special attention was given throughout to the methods of investigating agricultural problems and teaching agricultural subjects. There were also a number of special sessions which were utilized for conferences on general topics relating to agricultural education.

The faculty numbered 60, in addition to 18 speakers at the special sessions and conferences. It included 19 officers of the United States Department of Agriculture, 25 members of the faculty of Cornell University and 7 members of the staff of the New York Station, and 17 professors and experts from ten other agricultural colleges and experiment stations, besides the United States Commissioner of Education, a representative of Teachers College of Columbia University, and the New York State Commissioner of Agriculture and the State Entomologist.

In addition, lecture courses and seminars were offered by Dr. C. B. Davenport, of the department of experimental evolution of the Carnegie Institution; Director A. D. Hall, of the Rothamsted Experimental Station; Prof. L. B. Mendel, professor of physiological chemistry in the Sheffield Scientific School of Yale University, and Prof. Dr. N. Züntz, professor of animal physiology in the Royal Agricultural College of Berlin, which attracted particular attention. So great was the interest manifested in these courses that not infrequently the rooms assigned proved inadequate. Dr. Davenport gave five lectures and a seminar in the poultry husbandry course, the subjects of the lectures being: Origin of Domestic Fowl, Characteristics of Poultry, General Principles of Heredity, and Application of Principles of Heredity to the Breeding of Poultry (two lectures). Director Hall had the same number of lectures in the agronomy course, his lectures taking up Special Effect of Fertilizers upon the Character and Composition of the Crop, Special Effect of Fertilizers upon the Reaction and Texture of the Soil, and General Discussion of the Theory of Fertilizers in Relation to the Soil and the Plant.

Unusual interest centered around the course in biochemistry. This course was offered for the first time and proved exceedingly popular and profitable, and may be summarized as an example of the advanced grade of work offered by the school. Following an introductory lecture by Dr. C. F. Langworthy, of this Office, on Physiological Chemistry in Relation to Animal Nutrition, the remaining four lectures of the first week were given by Dr. A. L. Winton, of the Bureau of Chemistry of this Department, who took up the Microscopical Methods for Detecting Adulteration in Feeding Stuffs. Dr. Winton outlined the technique of such microscopical work and discussed methods showing in detail how it is possible to identify adulterants by differences in their structure as shown by the microscope in comparison with the standard food materials. In the weekly seminar opportunity was given for demonstrating in greater detail his methods and their application.

Dr. Mendel gave five lectures and two seminars during the following week. The first of the lectures discussed the Chemical Processes of the Alimentary Tract, the second Recent Progress in Chemistry of the Proteins and its Relation to the Problems of Nutrition, and the remaining three Intermediary Metabolism, taking up some aspects of the intermediary metabolism of nucleoproteins and purines and of the carbohydrates and also discussing the biochemical functions and protective mechanisms. The lectures well illustrated the very marked progress in physiological chemistry within the last few years, and directed attention to a very large amount of material which is not readily accessible but which is of the greatest importance to students of animal and human nutrition. The lectures were also noteworthy in that they demonstrated clearly the possibility of applying physiological methods to the study of practical problems and to both the important relation of many researches along other technical lines to nutrition and the important application of experiment station problems to many investigations in medicine, pathology, and other branches to which the attention of the experiment station worker might not ordinarily be directed.

Director Armsby gave the five lectures of the third week, the main topics being a general survey of the chemical constituents of plants and animals, the physiology of nutrition, feeding stuffs and feeding.

The fourth week of the course was occupied by Professor Züntz, who gave five lectures and held two seminars. In the lectures Professor Züntz discussed particularly Muscular Action, its Different Forms and its Influence on the Quantity and Quality of Metabolism; The Different Forms of Internal Labor Performed by the Resting Organism and their Influence on Metabolism; the Influence of Internal and External Temperature on Metabolism, and Aims and Methods of Research Regarding the Respiratory Process (two lectures). These lectures, which were of unusual interest, summarized and discussed the results of his extended researches on metabolism in men and animals, particularly the work with the respiratory quotient carried on by means of the valuable apparatus which he has devised. Professor Züntz brought with him from Berlin the respiratory quotient apparatus and in the seminars as well as in the lectures demonstrated methods of using it and also special apparatus for the analyzing of respiration and other gases. His visit also afforded many opportunities of discussing nutrition problems and related topics in a less formal way and was regarded as of the greatest value, not only because of the material presented, but as an inspiration for advanced research in nutrition.

The special sessions devoted to conferences on general topics proved of extreme interest and value, especially to those actually engaged in the work of our colleges and experiment stations. These conferences included addresses as follows: The Pedagogics of Agriculture, Dean

T. F. Hunt of the Pennsylvania College, and Prof. D. S. Snedden of Teachers College, Columbia University; Defence Work of Agricultural Experiment Stations, Director E. H. Jenkins of the Connecticut State Station and Director W. H. Jordan of the New York State Station; Extension Work in Agriculture, President G. C. Creelman of the Ontario Agricultural College, Prof. John Hamilton of this Office, and Director L. H. Bailey of Cornell University; Editing of Station Publications, Dr. E. W. Allen of this Office and F. H. Hall of the New York State Station; Agriculture in Secondary Schools, Dr. E. E. Brown, United States Commissioner of Education, D. J. Crosby of this Office, and Dr. G. F. Warren of Cornell University; Student Organizations, Director L. H. Bailey and M. G. Kains, assistant editor of American Agriculturist; Elementary Instruction in Agriculture, Prof. William Lochhead of Macdonald College, Canada, and D. J. Crosby; and Rural Economy, Prof. H. C. Taylor of the University of Wisconsin, Prof. G. N. Lauman, and Director L. H. Bailey. Considerable informal discussion followed the conferences and added much to their helpfulness.

In addition to the excursion to Geneva, already mentioned, numerous short trips were taken by classes and smaller parties to points of interest in the vicinity of Ithaça. A reception was given by Director and Mrs. Bailey at their residence to the faculty and students of the school.

Well attended meetings were held during the session of the graduate school by the following organizations: American Society of Agronomy, Association of Dairy Instructors and Investigators, International Conference of Poultry Instructors and Investigators (this resulting in the formation of an association), and the general convention of the Alpha Zeta Fraternity. A number of persons interested in the problems of animal nutrition also had a conference and took preliminary steps toward the organization of an association devoted to this subject. At these meetings subjects covering a wide range were discussed and a large number of the college and station men were brought into brief contact with the graduate school.

With the completion of the third session the graduate school may be fairly considered as having passed beyond the experimental stage. The measure of success attending it since its inception has abundantly justified its establishment, and should go far toward securing its continuance upon a permanent basis and its consistent development to meet our increasing needs.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Lectures on enzyms of bacteria, F. Fuhrmann (*Vorlesungen über Bakterienenzyme. Jena, 1907, pp. VIII+136, figs. 9, dgms. 5*).—A summary and discussion in lecture form of the bacterial enzyms with reference to proteid, fat, and carbohydrate cleavage, fermentation, glucosid cleavage, and related questions.

The polypeptidphosphoric acids (paranucleic acids) of caseins, A. Reh (*Beitr. Chem. Physiol. u. Path., 11 (1907), No. 1–2, pp. 1–18*).—Pepsin digestion products of casein treated with uranyl acetate yield a phosphorus-containing complex of constant composition, which the author designates as polypeptidphosphoric acid or as a mixture of such acids. The possible constitution of the substance, according to experimental data, is discussed, but definite conclusions are not drawn.

The tryptic digestion of egg albumin, P. A. Levene and W. A. Beatty (*Biochem. Ztschr., 4 (1907), No. 4–6, pp. 299–304*).—As cleavage products of egg albumin the author identified leucin, tryptophan, a single peptid with basic properties, and a lysin-glycyl.

The constituents of the essential oil of nutmeg, F. B. Power and A. H. Salway (*Jour. Chem. Soc. [London], 91 (1907), No. 542, II, pp. 2037–2058*).—The principal constituents isolated in this study of the essential oil of nutmeg were about 80 per cent *d*-pinene and *d*-camphene, about 8 per cent dipentene, and about 6 per cent of *d*-linalool, *d*-borneol, *i*-terpineol, and geraniol. A new alcohol and a new monocarboxylic acid were isolated in small amounts.

The investigation also showed "that the portion of nutmeg oil which has hitherto been designated 'myristicol' is a mixture of alcohols, of which terpineol appears to be the predominating constituent."

Contribution to the study of tannin, L. E. Cavazza (*Contributo allo Studio dei Tannini. Bologna, 1908, pp. 11*).—A brief preliminary discussion of the distribution and functions of tannin, method of extraction, new tannic compounds, method of purification, typical formula of constitution, an example of classification, differentiation of some tannins, and a microtechnic application of vanadium in the chemical study of tannin.

The determination of total nitrogen including nitrates in the presence of chlorids, W. D. Richardson (*Jour. Amer. Chem. Soc., 30 (1908), No. 3, pp. 421, 422; abs. in Chem. Zentbl., 1908, I, No. 16, pp. 1573, 1574*).—A method which has been found satisfactory for determining total nitrogen, including nitrates, in pickling solutions used for curing meats is described. The procedure is as follows: "(1) Determine nitric nitrogen by the Schloesing-Wagner method; (2) in another portion determine nitrogen excluding nitrates by adding to the substance in the Kjeldahl flask 10 cc. more or less of saturated ferrous chlorid solution and boiling with dilute sulphuric acid until nitrates are destroyed. Then proceed with the determination of the remaining nitrogen by the Kjeldahl or Kjeldahl-Gunning method. The sum of (1) and (2) gives the total nitrogen."

Determination of sodium and potassium in silicates, J. E. THOMSEN (*Jour. Amer. Chem. Soc., 30 (1908), No. 3, pp. 420, 421*).—A method of determining sodium and potassium in clay and silicates which can be decomposed by sulphuric and hydrofluoric acids is described.

The determination of phosphoric acid in Thomas slag by the Grete method, C. H. KETNER (*Chem. Weekbl., 4 (1907), pp. 757–764; abs. in Chem. Zentbl., 1908, I, No. 2, pp. 168, 169; Jour. Chem. Soc. [London], 94 (1908), No. 543, II, p. 64*).—The author adapts the Grete method of titration with gelatin-molybdic solution to the determination of total phosphoric acid in Thomas slag as follows: Dissolve 10 gm. of the fine-ground slag in 50 cc. of concentrated sulphuric acid, shaking vigorously and heating until white fumes begin to form. Dilute to 500 cc., mix, and filter after standing 12 hours. Neutralize 25 cc. of the filtered solution with ammonia, add 20 cc. of ammonium nitrate solution (1:2), a teaspoonful of powdered potassium nitrate, and 15 cc. of nitric acid (1.2 sp. gr.), heat to boiling, and titrate.

The method of Trillat and Turchet for the determination of ammonia in waters, A. CORSINI (*Gior. R. Soc. Ital. Ig., 28 (1906), No. 3, pp. 119–131; abs in Ann. Chim. Analyt., 13 (1908), No. 2, p. 75*).—On the basis of his tests of this method (E. S. R., 17, pp. 112, 113) the author recommends it for the following reasons: It is more sensitive than the Nessler process and requires only such substances as are found in all laboratories.

On the importance of the qualitative detection of iron in water, H. KLUT (*Allg. Brau. u. Hopfen Ztg., 48 (1908), No. 39, pp. 401, 402*).—Various simple tests are described, but for ordinary waters preference is given to the use of 10 per cent sodium sulphid.

Ash constituents of cereals, W. P. GAMBLE (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 85–89*).—A comparison of the Shuttleworth method (E. S. R., 11, p. 304; 12, p. 308) and the official method in the examination of the ash constituents of a sample of wheat (grain and straw) is reported.

Loss of phosphoric acid in ashing of cereals, S. LEAVITT and J. A. LECLERC (*Jour. Amer. Chem. Soc., 30 (1908), No. 3, pp. 391–394*).—The results obtained with a number of samples of wheat by various methods of incineration are reported. These show "that the temperature of ashing below fusion is not so important a factor where only the percentage of ash is desired, but when determining the phosphorus as phosphoric acid in ash the greatest caution must be observed to keep the temperature below the volatilization point of the combined phosphorus."

A new method for the rapid estimation of dry matter in wheat gluten, W. BREMER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 11, pp. 682–686, figs. 3*).—In the method described the wheat gluten is brought in close contact with porous plates which absorb the water.

Determination of starch in potatoes, L. PELLET and MÉTILLON (*Ann. Chim. Analyt., 13 (1908), No. 1, pp. 9–12, fig. 1*).—A study of methods.

The Ley honey test, M. KOEBNER (*Chem. Ztg., 32 (1908), No. 8, p. 89*).—Ley[a] reports that artificial honey with ammoniacal silver solution gives a silver precipitate, while natural honey gives a fluorescent solution. According to the author's investigations, the fluorescent condition is due to the presence of colloidal silver, a condition induced by a number of bodies of high molecular structure, including protein among others. Apparently this reaction is caused in natural honey by the presence of volatile aromatic bodies and the author contends, therefore, that the test should be made with the distillate rather than with the original materal, because if a little albumin, for instance, egg white, were added to artificial honey it would also give the colloidal silver reaction.

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[a] Pharm. Ztg., 47 (1902), p. 603.

The examination of egg and milk noodles, W. Plücker (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 12, pp. 748–754*).—The occurrence on the market of noodles reputed to contain eggs and milk led the author to study the composition of these goods in comparison with noodles made under known conditions with and without the addition of eggs and milk. From the analytical data obtained he concludes that the determination of the lecithin-phosphoric acid content does not furnish a means of judging of the character of such goods. The fat content and the iodin value are of use for the purpose, the fat value of noodles containing milk being increased some 50 per cent. The iodin value is useful only in the case of fresh goods, as it decreases materially when noodles are kept.

The detection of chicory in coffee, H. Kreis (*Ber. Chem. Lab. Basel, 1906, p. 24; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 10, p. 660*).—It was found that coffee decoction, even if coffee essence had been added, did not reduce Fehling's solution after treatment with sodium-hydroxid solution and lead acetate. However, on the addition of as little as 2.5 per cent of chicory to ground coffee such a reaction was plainly evident.

Method for the determination of alcohol in wine, M. Duboux and P. Dutoit (*Ann. Chim. Analyt., 13 (1908), No. 1, pp. 4–9*).—The method proposed is based upon the determination of the temperature of miscibility of alcohol with other liquids—that is, upon the critical temperature of dissolution.

Alcoholic strength of wines, Perkins (*Jour. Dept. Agr. So. Aust., 11 (1907), No. 5, pp. 445–453*).—A discussion of methods.

Determination of tartaric acid in cider, G. A. Le Roy (*Ann. Chim. Analyt., 13 (1908), No. 1, pp. 16, 17*).—The qualitative method proposed depends upon the color reactions of a sulphuric acid solution of resorcin or pyrogallol in the presence of different organic acids.

The Schardinger reaction for differentiating between raw and cooked milk, A. Hesse (*Milchw. Zentbl., 4 (1908), No. 2, pp. 49–57*).—A study of the conditions under which the Schardinger reaction, depending upon the use of a solution of methylene blue and a saturated alcoholic solution of methylene blue with formalin, may be used to detect cooked milk or even the addition of a small quantity of cooked milk to raw milk.

Rapid methods for determining moisture in butter, R. Harcourt and H. L. Fulmer (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 70–72*).—Data obtained in a comparison of the results from the use of the Richmond or "Beaker" method, Gray's original method, and Gray's improved method, with those from the use of the official method of determining moisture in butter are reported.

"The results from both the Beaker method and Gray's improved method compare very favorably with those from the official method. The Beaker method tends to give results which are a little too high, but the greatest error shown only amounts to 0.5 per cent and most of the results correspond almost exactly with, or differ only so slightly from, those of the standard that the difference might easily be due to experimental error. On the other hand, Gray's improved method inclines to give results slightly too low, but, here again, the greatest error is only 0.4 per cent, and the same remarks concerning the Beaker method will apply here also. These two methods are certainly remarkably accurate, and can without any hesitation be highly recommended for commercial and factory work. The original Gray method gives results which are much too low (as much as 1.0 per cent in sample 20) to be reliable."

A further comparison of methods at this institution is noted on page 1178 of this issue.

The caprylic acid determination in butter fat, R. K. Dons (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 2, pp. 75–79*).—The method proposed depends upon the fact that caprylic acid is only slightly soluble in water but is easily soluble in a mixture of myristic, palmitic, and oleic acids. After the usual saponification of the butter fat and decomposition of the soap, shaking with water at 80° C. removes the soluble volatile acids, as butyric and caproic, and the caprylic acid is then separated from the insoluble acids by distillation and titrated with silver nitrate.

Estimation of cocoanut oil in butter, R. Ross and J. Race (*Chem. News, 97 (1908), No. 2519, pp. 110, 111; abs. in Analyst, 33 (1908), No. 385, p. 122*).—The authors consider the process described by Hodgson (E. S. R., 19, p. 914) to be useless. They point out that the quantity of sulphuric acid proposed has a considerable action on the permanganate used for oxidation. With smaller quantities of acid the oxygen equivalents obtained by oxidizing fats are unsatisfactory for differentiating one fat from another.

The Polenske number, M Fritzsche (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 4, pp. 193–233*).—The experiences of other investigators in the determination of the Polenske number are reviewed, especially with regard to the method of making the test for the estimation of cocoa fat in butter and to the judging of butter on the basis of this constant. The author believes that the Polenske method is on a sound basis, and that the various modifications that have been suggested offer no substantial advantage. The quantity and fineness of the pumice-stone powder used in the distillation are important. Satisfactory results are obtained when, with strict adherence to the other conditions of the test, 0.5 gm. of the powder of 1 mm. fineness is used.

The important results of the author's work in the determination of the Polenske number in 355 samples of pure Holland butter are reported and discussed. In the majority of the tests the value was below the minimum given by Polenske, and in none was the maximum exceeded. In butter from most of the Netherlands provinces the constant was lowest in March and April and highest in February. In no case was the results affected by the feeding of cocoa cake or beets.

Distillation apparatus for nitrogen determinations, C. Bloch (*Pharm. Ztg., 52 (1907), p. 311; abs. in Ztschr. Angew. Chem., 21 (1908), No. 7, p. 315*).—The special feature of this apparatus is a funnel attached to the distillation flask so that solutions may be added without opening the flask.

Passerini's calcimeter, P. Fantechi (*Bol. Ist. Agr. Scandicci, 2. ser., 7 (1908), No. 1, pp. 103–107, fig. 1*).—The construction and method of using this piece of apparatus for the quick determination of the lime content of soils are described.

An accurate form of gas analysis apparatus for commercial and other purposes, W. A. Bone and R. V. Wheeler (*Jour. Soc. Chem. Indus., 27 (1908), No. 1, pp. 10–12, fig. 1*).—The authors describe "a convenient and not too costly adaptation of the gas analysis apparatus used throughout their researches on combustion, which shall meet the daily requirements of a commercial research laboratory."

Regulations for the examination of feeding stuffs in the laboratory of the Colonial Museum at Haarlem (*Separate from Pharm. Weekbl., 44 (1907), No. 26, Sup., pp. 29*).—A second edition of the Dutch official methods for the analysis of feeding stuffs. The publication contains introductory material by M. Greshoff.

Chemicals and allied products (*Bur. of the Census [U. S.] Bul. 92, pp. 124*).—Among the topics discussed in this publication are several of agricultural interest, including potashes, wood distillation, fertilizers, tanning materials, paints, and varnishes.

Sugar chemistry, E. O. von Lippman (*Deut. Zuckerindus., 33 (1908), Nos. 6, Beilage 1, pp. 151–154; 7, Beilage 1, pp. 172–174; 8, Beilage 1, pp. 201, 202*).—A review of the most important work in this field appearing in the second half of 1907.

METEOROLOGY—WATER.

Studies on the phenomena of the evaporation of water over lakes and reservoirs, F. H. Bigelow (*Mo. Weather Rev., 35 (1907), No. 7, pp. 311–316; 36 (1908), No. 2, pp. 24–39, figs. 15*).—The article explains the need for investigation of evaporation as well as the availability of Salton Sea for such investigations. The proposed plan and method of the investigation are also described in some detail, with discussion of theoretical considerations entering into the problem, and a report of preliminary studies made at Reno, Nev., to obtain "a more intelligent view of the problem." By means of instruments and evaporating pans placed on rafts in the Reno reservoir and at different heights on towers in its immediate vicinity records were made of the temperature, vapor pressure, and rate of evaporation.

The results throw some light on the cause of discrepancies between results of observations of other investigators on evaporation. For example, "they show clearly that the location of the pans relative to the water of a reservoir is of primary importance in measuring the total amount of evaporation, and that observations on a pan away from the water can not be transferred to the water surface itself except with the utmost caution."

The need of self-registering apparatus for studies of this kind was very clearly shown.

It was found in these investigations that "if a measure of the height of the water in the pan be made at 7.30 a. m., and another at 10.30 a. m., the difference multiplied by 8 will be closely the total evaporation for the day. This rule holds at Reno, Nev., during the summer, but it should be verified in other localities. Furthermore, in the arid regions of the West it seems probable that a lake or reservoir evaporates about five-eighths as fast as an isolated pan placed outside the vapor blanket; in other words, this vapor blanket seems to conserve about three-eighths of the water that would otherwise be lost by the evaporation.

"It is important that similar experiments with towers be made in the central and eastern portions of the United States, in the prevailing damp climates, to discover whether similar rules can be applied in practice."

Monthly Weather Review (*Mo. Weather Rev., 36 (1908), Nos. 1, pp. 1–16, charts 8; 2, pp. 17–50, figs. 15, charts 19*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of January and February, 1908, recent papers bearing on meteorology and seismology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 1—Biographical note on Mr. Frank Ridgway; and No. 2—Biographical note on Mr. Thomas S. Collins, and Studies on the Phenomena of the Evaporation of Water over Lakes and Reservoirs (illus.), by F. H. Bigelow. (See above.)

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and T. A. BARRY (*Massachusetts Sta. Met. Buls. 231, 232, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1908. The data are briefly discussed in general notes on the weather of each month.

Weather report for 1907, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 24–27*).—Tabular summaries are given of observations at Guelph and six other places in the Province of Ontario on temperature, precipitation, and length of season. A summary is also given of reports on buildings, animals, and trees struck by lightning during the year.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 1 (1908), pt. 2, pp. 64–133, figs. 12, charts 3*).—This number contains the following articles: The Change of Phase due to the Passage of Electric Waves Through Thin Plates and the Index of Refraction of Water for Such Waves, with Applications to the Optics of Thin Films and Prisms (illus.), by W. R. Blair; Pyrheliometer and Polarimeter Observations (illus.), by H. H. Kimball; Note on the Movement of Moisture in Soils, by W. J. Humphreys (E. S. R., 19, p. 716); Note on the Magnetic Field due to an Electric Current in a Straight Wire (illus.), by W. J. Humphreys; A Kite for Use in High Winds, by W. R. Blair; and Upper Air Temperatures for October, November, and December (illus.), by W. R. Blair.

Absolute determination of the nocturnal radiation at Vienna, J. KRĚMÁŘ and R. SCHNEIDER (*Sitzber. K. Akad. Wiss. Wien, Math. Naturw. Kl., 116 (1907), Abt. IIa, pp. 571–600; abs. in Sci. Abs., Sect. A—Phys., 10 (1907), No. 120, pp. 652, 653*).—Measurements 202 meters above sea level, 26 meters above ground, and 2 meters above the instrument platform in August and September, 1906, with two Ångström electric compensation actinometers are reported. For 5 nights readings were taken every 15 minutes commencing at 8 p. m., that is, about an hour after sunset.

It was found that the loss by radiation was very rapid at first, attaining its maximum between 9 and 10 p. m., declining then, but with a faint secondary maximum at 2 a. m., and continuing slow until about three-quarters of an hour before sunrise, when the loss was again rapid. With falling air temperature the loss by radiation became less marked. The mean loss per minute per square centimeter was 0.153 gram-calorie. "By reflex radiation from the nonluminous atmosphere the ground in September gained 0.37 calorie per square centimeter per minute. The total radiation received from the sun during the three first September days—as regularly measured by the pyrheliometer at Vienna—was 318, 321, 311 calories, or, allowing for diffusion losses of 40 per cent according to Trabert, 445, 449, 435 calories. Assuming the same rate of loss by radiation for the day as determined for the night, the heat gain per square centimeter would have been on those three days +215, 228, 225 gram-calories per square centimeter, mean value 223 gram-calories per day."

The climate and weather of Baltimore, O. L. FASSIG (*Md. Weather Serv., 2 (1907), pp. 515, pls. 24, figs. 170*).—This is the second volume of a series of reports on the climatic features of Maryland. The first volume (E. S. R., 12, p. 119) was a general summary of all available information regarding the physiography and meteorology of the State. This volume gives an exhaustive study based upon all available public and private records of the climate and weather of Baltimore and vicinity.

"The report is divided into two parts. The first [which has previously been printed separately (E. S. R., 16, p. 1058; 17, p. 531)] deals with the average and extreme values of the meteorological elements recorded in the city of Baltimore. The discussion is based upon careful observations extending over a period of nearly a century. The second part deals with types of weather experienced in Baltimore and vicinity—hence with the actual physical condition of the atmosphere at stated times, during the prevalence of storms, cold and warm waves, etc."

Climatology [of South Carolina], J. W. BAUER and E. J. WATSON (*Handbook of South Carolina. Columbia: State Dept. Agr., Com. and Immig., 1907, pp. 66–76, figs. 2*).—The climatological conditions and relations are summarized by the director of the South Carolina section of the Weather Bureau of this Department.

A general summary of climatological conditions as related to agriculture in Cuba, 1907, L. G. Y CARBONELL (*Bol. Ofic. Sec. Agr. Cuba, 4 (1908), No. 1, pp. 30–43, pls. 2*).—Observations on temperature, precipitation, cloudiness, and wind at various stations in Cuba are tabulated and briefly discussed.

Contribution to the climatology and hydrography of Central America, A. MERZ (*Beiträge zur Klimatologie und Hydrographie Mittelamerikas. Leipsic, 1907, pp. 96, pls. 4; Mitt. Ver. Erdk. Leipzig, 1906, pp. 1-96, pls. 4; rev. in Mitt. Justus Perthes' Geogr. Anst., 53 (1907), No. 12, p. 235*).—This report summarizes the more important available data regarding temperature, rainfall, cloudiness, and winds at different places in Central America, but especially in Nicaragua, particular attention being given to the relation of rainfall, run-off, and evaporation. The article is based in large part upon a report of A. P. Davis on the hydrography of the Isthmus of Nicaragua (E. S. R., 14, p. 926).

It is explained that for the region typically represented by San Juan, Nicaragua, the year is divided into a summer rainy season with maxima, one in June and the other in October, and a dry season, which extends from January to April. The total rainfall is as a rule quite high, particularly on the eastern side of the mountains (6,483 mm. at San Juan), but varies widely with elevation and location with reference to the mountains, the west side of the mountains being comparatively dry. The run-off varies with the rainfall and with the forest cover. The greatest deficit in run-off occurs in the areas covered by primeval forests, and is attributed to evaporation rather than to utilization of the moisture by the forest growth. On the larger plains the evaporation varies from about 1,000 to 1,100 mm., with rainfall of from 1,500 to 4,000 mm.

Weather conditions in Denmark, 1906–7, V. WILLAUME-JANTZEN (*Tidsskr. Landøkonom., 1907, No. 13, pp. 686–701*).—The principal meteorological conditions are summarized for each month.

Observing and forecasting the weather, D. W. HORNER (*London, 1907, pp. 46; rev. in Bird Notes [Brighton], 6 (1907), No. 8, pp. 249, 250*).—This booklet, intended for nature lovers, contains brief chapters on clouds, wind, halos and kindred phenomena, thunderstorms, weather sayings, the moon and the weather, and phenological observations, dealing only with meteorological phenomena which can be observed without instrumental aid.

On the need of ground water observations, KRÜGER (*Jahrb. Deut. Landw. Gesell., 22 (1907), No. 4, pp. 778–789*).—The need from the agricultural standpoint of studying and charting the underground waters is discussed.

Surface water supply of Colorado River drainage above Yuma and the Great Basin drainage, 1906, R. I. MEEKER, E. C. LARUE ET AL. (*U. S. Geol. Survey, Water-Supply Papers Nos. 211, pp. 149, pls. 2, figs. 2; 212, pp. IV+98, pls. 2, figs. 2*).—These reports contain information similar to that published in previous years under the title "Report on the Progress of Stream Measurements."

Water resources of Beaver Valley, Utah, W. T. LEE (*U. S. Geol. Survey, Water-Supply Paper No. 217, pp. 57, pl. 1, figs. 3*).—The investigations here reported cover an area of 1,200 square miles in the eastern third of Beaver County, and include "the determination of the flow of streams and springs, of the manner of occurrence and quantity of the underground waters as shown by the geologic and geographic conditions of the region and by the distribution of springs and wells, and of the chemical character of the waters with reference to their adaptability to domestic use and to irrigation."

The water soluble humus substances in Norwegian fresh waters, O. ASCHAN (*Jour. Prakt. Chem., n. ser., 77 (1908), No. 4, pp. 172–188, dgms. 3*).—A study of the chemical composition and properties of these substances is reported.

Progress in the chemistry of water, A. GOLDBERG (*Chem. Ztg., 32 (1908), Nos. 15, pp. 173–175; 16, pp. 187–189; 17, pp. 203–205*).—This is a review of recent investigations in this field, covering water supply and purification, action of water on pipes and conduits, water for use in steam boilers, and general and analytical investigations.

Studies on the filtration effect of ground water, G. KABRHEL (*Arch. Hyg., 64 (1908), No. 3, pp. 295–312, fig. 1*).—This is a second paper reporting investigations on the capacity of the soil to remove micro-organisms from the percolating water.

Sewage disposal for institutions and small communities, T. HORTON (*Proc. Ann. Conf. Sanit. Off. N. Y., 7 (1907), pp. 96–106*).—The following are given as the general features of a sewage disposal plant suited to the requirements of a small community or institution requiring a high standard of purification:

"(1) A combined screening and settling chamber of moderate capacity, provided with screens, for the removal of the coarse or grosser solids from the sewage.

"(2) A settling basin or septic tank for the precipitation or transformation of a considerable portion of the organic and mineral suspended matters.

"(3) A biological filter of the slow sand or rapid coarse grained type for the oxidation and nitrification of the organic matters remaining in the settled or septic sewage.

"(4) A small settling basin, into which the effluent from the biological filters is received and sterilized, for the precipitation and destruction of the remaining suspended matters and bacteria."

SOILS—FERTILIZERS.

The fertility in Illinois soils, C. G. HOPKINS and J. H. PETTIT (*Illinois Sta. Bul. 123, pp. 187–294, figs. 8, map 1*).—This bulletin summarizes the results of 6 years' work on Illinois soils, showing the area and distribution of the typical soils of the State, their content of plant food, and the systems of manuring and cropping which investigation has shown to be best suited to the increase or maintenance of their fertility.

It is shown that Illinois soils may be grouped in 14 main classes, namely, unglaciated areas, Illinoisan moraines, lower Illinoisan glaciation, middle Illinoisan glaciation, upper Illinoisan glaciation, pre-Iowan glaciation, Iowan glaciation, deep loess areas, early Wisconsin moraines, late Wisconsin moraines, early Wisconsin glaciation, late Wisconsin glaciation, old river bottom and swamp areas, and sand, late swamp, and bottom lands. These main classes are subdivided into peats, peaty loams, mucks, clays, clay loams, silt loams, loams, sandy loams, sands, gravelly loams, gravels, stony loams, and rock outcrop.

"In the final system of numbering and classifying individual soil types the Dewey library system of numbers is used, whole numbers being assigned to important and definite soil types and decimals employed for related types possessing some distinct variations. In all cases the name is designed to carry with it as complete a description as practicable of the soil type, so as to avoid any unnecessary tax on the memory of the student or farmer."

Some 90 soil types have thus far been recognized in the detailed soil survey of the State. These soil types are shown to vary widely not only in physical characteristics but in chemical composition. Analyses of a large number of samples of surface and subsurface soil and subsoil from the typical areas are reported, the results being calculated to the acre basis.

"Each soil area may contain several or many different soil types. One soil type may contain twenty times as much of some necessary element of plant food as is found in another type, and the total supply of one element in a given type of soil may be one hundred times as great as the supply of another equally essential element in the same soil, when measured by crop requirements."

The experiments that have been made on the various types of soils show that they may be improved by proper soil treatment, including the use of rotations containing leguminous plants and the application of lime in the form of carbonate and phosphoric acid in the form of fine-ground insoluble phosphates. The use of potash salts has been found profitable in case of peaty swamp soils but not generally beneficial on other soils.

Report of work at Holly Springs branch experiment station, 1906, C. T. Ames (*Mississippi Sta. Bul. 108, pp. 16, figs. 10*).—This report is devoted mainly to a description of the 200-acre farm secured for the use of this substation and to the methods employed for reclaiming and improving it, particularly the efforts which have been directed toward the filling of washes and gullies, terracing, fencing, and fertilizing.

Three common methods of terracing the land are described. The system employed at the substation consists of embankments and rows having a small fall to conduct surplus water slowly. "The embankment is essentially a very much enlarged hillside ditch, the bottom of which being 4 to 6 feet wide and the bank from 4 to 6 feet wide and about 18 in. high. This broad shallow ditch and broad embankment can be crossed with rows and implements and so cultivated as to lose very little land and can be kept as free from weeds and grass as other parts of the field." The methods of constructing such terraces are described. In the experience of the substation such terraces can be constructed at a labor cost of 7 cts. per rod. It is stated to be "entirely feasible to fill the small gullies and washes and to 'deaden' the larger ones. A 'dead' gully does not increase in size, does not get wider or longer. To 'deaden' a gully, slope the sides by digging off and plowing the upper edges and start something growing such as Lespedeza, Bermuda, and black locust. Filling the smaller gullies is a quick and simple operation and is essentially a team job. First, prepare for the team by digging off the upper edges with a mattock, then use good plows (to include a good ditch bank plow) and good teams. The cost of filling gullies is not much—less than $1 per acre for the largest and most desirable areas. All the gullies, large and small, were filled on a badly washed hillside for $5.62 per acre."

Comparative tests on cotton and corn of various combinations of cotton-seed meal, acid phosphate, and kainit are reported and indicate in general that the most beneficial fertilizer combination for both cotton and corn on the brown loam soils of this region is made up of equal parts of cotton-seed meal and acid phosphate, an application of 200 lbs. per acre of such mixture being recommended.

Analysis of soils from Mt. Barker (*Jour. Dept. Agr. West. Aust., 15* (*1907*), *No. 10, p. 783*).—The total and available plant food in 5 samples of soils from this district of Western Australia is reported, with some discussion of their fertilizer requirements. The region is of special interest because of its adaptability to the cultivation of apples for export.

On the types of "Szik" soils of the Hungarian Alföld, A. von Sigmond (*Földtani Közlöny, 36* (*1906*), *No. 10–12, pp. 439–454; abs. in Chem. Abs., 1* (*1907*), *No. 24, pp. 3037, 3038*).—"Szik" (salt) soil is the term generally applied in Hungary to soils rendered unproductive by excess of sodium salts. It is, however, applied to other unproductive soils which contain little or no sodium salts, viz, stiff, compact, fine-grained (not larger than 0.5 mm. in diameter) soils, through which water percolates slowly and which form hard crusts on drying. These soils leave comparatively small residues and yield to solution comparatively large amounts of silica, iron, alumina, and calcium compounds when treated with strong acids (as in ordinary soil analysis). The clay content increases with the depth, as does the calcium carbonate.

In general it appears that the "szik" soils are but moderately weathered and slightly leached. The most common sodium salt is the sulphate. The stiff "szik" soils are variable in soluble salt content and the author separates them in this article into (1) those containing less than 0.1 per cent of alkali, which under otherwise favorable conditions and with addition of lime and humus, which are frequently deficient, are productive, and (2) those containing more than 0.1 per cent alkali, which are unproductive.

The true alkali (soda) soils are grouped as sandy, loam, and clay soils. These soils are generally underlain by a hardpan, are strongly alkaline in reaction, and form an alkali crust on the surface. The soils of this group contain a maximum of 2 to 2.5 per cent of soluble salts, mainly sodium carbonate and chlorid.

Alkali soils, their nature and reclamation, F. T. Shutt (*Canada Cent. Expt. Farm Bul. 4, 2. ser., pp. 11, pls. 2; abs. in Jour. Soc. Chem. Indus., 27* (*1908*), *No. 10, p. 513*).—"In this bulletin the origin of the different sorts of 'alkali' soils is discussed, also their composition and characteristics, and methods of treatment are suggested whereby the alkali in such soils may be lessened or removed." Information is also given as to the crops adapted to alkali soils. The information given in the bulletin is suited especially to the use of "farmers living in those parts of the great Northwest plains and British Columbia where alkali is occasionally found."

Comparative investigations on the results of chemical soil analysis and vegetation experiments, K. Opitz (*Landw. Jahrb., 36* (*1907*), *No. 5–6, pp. 909–932; abs. in Chem. Zentbl., 1908, I, No. 3, p. 285; Chem. Ztg., 32* (*1908*), *No. 15, Repert., p. 90; Jour. Chem. Soc.* [*London*], *94* (*1908*), *No. 547, II, p. 421*).—Investigations on a large number of Hessian soils are reported in which an attempt was made to compare the results of pot experiments with oats with the chemical composition as shown by solubility of the phosphoric acid, potash, and lime in 10 per cent hydrochloric acid, the soils being digested in the latter for 3 hours in a boiling water bath with constant stirring.

The results show that only from 10 to 11 per cent of both light and heavy soils examined by the author contained a sufficient amount of easily soluble phosphoric acid. About 55 per cent of the heavy soils and 50 per cent of the light soils contained a sufficient amount of easily soluble potash compounds. As a rule 0.1 per cent of phosphoric acid soluble in 10 per cent hydrochloric acid may be considered sufficient. Heavy soils containing less than 0.1 per cent of potash soluble in 10 per cent hydrochloric acid may be considered in need of easily soluble potash. Light soils containing over 0.1 per cent of potash may with reasonable certainty be considered as not in need of additional amounts of assimilable potash. The presence of a relatively high content of carbonate and humate of calcium (not less than 0.25 per cent) affords assurance that the soil is not deficient in easily soluble lime compounds.

Absorption of vapors and gases by soils, H. E. PATTEN and F. E. GALLAGHER (*U. S. Dept. Agr., Bur. Soils Bul. 51, pp. 50, figs. 19*).—This bulletin reviews previous investigations on the absorption of water vapor and of gases and gives the results of original investigations by the authors on the absorption of water vapor by various types of soils under varying conditions. The data contained in the bulletin are summarized as follows:

"In the absorption of water vapor by quartz flour, a soil separate, and typical soils, the rate of approach to equilibrium between soil and water vapor has been followed at various degrees of humidity, and these equilibrium points determined.

"The amount of water absorbed increases with the humidity, but not in a simple mathematical relation.

"Toluene and other vapors were compared with water vapor, using the same soils, and show in general an absorption of the same order of magnitude.

"The velocity of absorption decreases regularly as absorption proceeds, but it is not described by a simple logarithmic equation.

"Relatively small decrease in vapor pressure produces a marked increase in the rate at which the soil dries out. At the moisture content known as 'optimum' for plant growth, a rapid decrease in the rate of evaporation takes place, and at this particular moisture content there are likewise changes in other physical characteristics of the soil, such as specific volume, resistance to penetration, etc., which altogether point strongly to a purely physical reason for the existence of a narrow range of water content in a soil at which plants thrive best [E. S. R., 19, p. 818].

"The content of water in a soil at which plants begin to wilt is greater than the quantity of water the soil can take up from a saturated atmosphere. A heavy soil containing a high percentage of moisture may hold the water so absorbed that while the plant can get some water still it is by no means fully supplied.

"The absorptive capacity of soil for water vapor is generally higher the finer the texture of the soil and the greater the content of humus. In general, productive soils have a very considerable capacity for water vapor.

"Gases are absorbed to a different degree by each solid substance; the different soil components all possess a considerable absorption capacity, and mixtures of these constituents absorb gases additively; that is, each soil material exerts its absorptive effect independently of the rest of the soil about it. Soil constituents moistened with water absorb gases in greater quantity than would the same mass of water alone. Easily condensed gases are in general absorbed more easily.

"Heat is evolved during the process of absorption, and this heat is greatly in excess of that given out by the condensation of the vapor to a liquid.

"For equilibria between soils and atmosphere saturated with water vapor over a temperature range from 25° C. to 100° C., the amount of water absorbed decreases with increasing temperature. This confirms the results obtained by earlier investigators for the absorption of water vapor as well as for gases in general.

"Absorbed gases are held with remarkable tenacity. Glass and minerals retain hygroscopic water up to 500° to 800° C.

"Bodies which have been heated and then cooled in a vacuum show high absorptive power; consequently, absorption can not be looked upon solely as the solution of a gas in moisture films upon the grains of the solid.

"In general, nitrogen is absorbed by soils in greater quantity than oxygen. This is especially interesting, since the absorption of oxygen and nitrogen from air by water gives a higher ratio of oxygen to nitrogen in the solution than the 1 : 4 relation which exists in air. The similar high absorptive power of aluminum hydroxid, ferric hydroxid, and magnesium carbonate for nitrogen indicates that this preference of soils for nitrogen is a real phenomenon, since these substances have no way of making their true absorptive power for oxygen by converting it chemically to carbon dioxid, as a soil does, or to other oxids.

"The absorption of carbon dioxid by soils is due in great measure to the presence of hydrated oxids, such as ferric oxid, and humus. Kaolin, calcium carbonate, and quartz also absorb carbon dioxid, but in comparatively small amounts.

"Soils, whether acid or alkaline, dry or wet, absorb ammonia from the atmosphere in appreciable amount.

"No one mathematical expression has been found to hold generally for the distribution of a gas between the vapor phase and absorbing solid. The specific attraction of solid and gas, the diffusion of gas into solid, the condensation of gas to liquids, and consequent clogging of capillary channels where the forms and arrangement of these minute spaces enter to determine the vapor pressure of the liquid there enmeshed, all these factors complicate the observed relation of mass of gas absorbed to mass of gas left in the vapor phase."

The flocculation of turbid liquids by salts, A. D. Hall and C. G. T. Morison (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 244–256, pl. 1*).—This article records studies of the influence of calcium nitrate, sodium chlorid, barium chlorid, aluminum sulphate, and other salts, as well as various acids of different strengths on the flocculation of suspensions of purified, fine-ground kaolin.

It was observed that "up to a certain point, flocculation, as measured by the rapidity of settlement, is proportional to the amount of flocculating salt added. Beyond that limit all solutions flocculate alike." The reaction between the flocculated material and the flocculating substance was found to be quantitative. Apparently the process of flocculation was not "accompanied by any removal of the salt from solution by the flocculated kaolin (adsorption or laking out), nor by any selective absorption of base from the salt, so as to give rise to acidity in the liquid after flocculation had taken place."

A comparison of the flocculating powers of different substances showed that the free acids were the most active flocculating compounds and that aluminum salts stand very close to the acids in this respect.

Experiments with fine-ground bauxite and limonite showed that neither of these substances would assume the "natant" condition in pure water.

The authors failed to find any satisfactory theory that embraces all of the observed facts and they believe that "before any theory of flocculation can be reached it is probably necessary to determine the conditions which must be satisfied before a given substance will assume the 'natant' state." They suggest, however, that the "natant condition is dependent on the presence of traces of free alkali derived from the partial hydrolysis of the suspended material . . . and that flocculation ensues when these are neutralized or driven back into combination with the suspended solid."

Note on the protective action of colloids on clay suspensions, G. Keppeler and A. Spangenberg (*Jour. Landw., 55 (1907), No. 4, pp. 299, 300; abs. in Chem. Zentbl., 1908, I, No. 3, pp. 285, 286*).—Observations similar to those of Fickendey (E. S. R., 18, p. 616) are briefly reported. The author states that the concentration of alkali most effective in preventing flocculation varies widely with different clays and is characteristic for each. The differences in this respect in case of natural clays are ascribed in part at least to variations in humus acid content. The injurious effect of heavy liming of moor soils is ascribed to precipitation of humus acid, thus preventing it from rendering plant food in the soil available.

On the radioactivity of certain soils, J. H. Howell (*Trans. and Proc. New Zeal. Inst., 39 (1906), pp. 223-226, figs. 2*).—The fact that the therapeutic properties of the water of certain mineral springs has been ascribed to the germicidal properties of their radioactive products led the author to undertake a study of the radioactivity of the deposits from a number of mineral springs as well as of a light volcanic soil (surface and subsoil) and of a clay soil. A special form of electroscope used in these investigations is described. The results indicated the presence of radioactive substances in small quantities in the mineral springs deposits and in larger quantities in both surface soils, while the hard volcanic subsoil was about six times as active as the surface soil.

Oxidation in soils and its relation to productiveness. The influence of partial sterilization, F. V. Darbishire and E. J. Russell (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 305-326, figs. 3*).—In the experiments here reported samples of soil which had been treated with volatile antiseptics (carbon bisulphid, toluene, and chloroform), nonvolatile antiseptics (copper sulphate and mercuric chlorid), and sterilized by steam, were tested by means of the oxidation method described in a previous article (E. S. R., 17, p. 536) and in pot experiments.

The results are summarized as follows: "(1) Partial sterilization of soil either by heating to 100° or by treatment with volatile antiseptics which are subsequently removed leads to a marked increase in the amount of oxygen absorbed by the micro-organisms of the soil. (2) The yield of nonleguminous crops is distinctly larger on partially sterilized than on unsterilized soils. Leguminous crops, however, show no increase. (3) Analysis shows that partial sterilization causes an increase in the amount of nitrogen, phosphoric acid, and potash taken up by the crop, and in the percentage of nitrogen and phosphoric acid in the dry matter. In other words it increases the 'availability' of these plant foods. (4) The increased availability of the plant food appears to be connected with the modification of the bacterial flora brought about by partial sterilization. When the soil is heated, however, chemical decomposition also takes place."

The increase of nitrogen in certain soils due to nitroculture, A. M. Wright (*Trans. and Proc. New Zeal. Inst., 39 (1906), pp. 121-123; abs. in Chem. Abs., 2 (1908), No. 4, p. 570*).—Pot experiments are reported in which garden peas were grown on inoculated and uninoculated soils with and without the addition of sulphate of potash and superphosphate. The nitroculture used was that prepared by this Department, and seed and soil inoculation were compared on 3 different soils, one being of a peaty character. There was apparently a decided increase of nitrogen when the seed was inoculated, and this increase was greater when sulphate of potash and superphosphate were added to the soil. Except in case of the peaty soil and of a soil to which starch had been added there was apparently no particular increase of nitrogen due to inoculating the soil.

Inoculation of soils and seeds, A. Demolon (*Jour. Agr. Prat., n. ser., 14 (1907), No. 51, pp. 784-786*).—This is a brief account of recent progress in this line, calling attention especially to the work of Bottomley (E. S. R., 19, p. 832).

The fixation of atmospheric nitrogen by plants, W. J. U. Woolcock (*Pharm. Jour. [London], 4. ser., 26 (1908), No. 1959, pp. 28, 29*).—This is also a brief account of the experiments by Bottomley.

The efficiency of pure culture inoculation for legumes, F. L. STEVENS and J. C. TEMPLE (*North Carolina Sta. Rpt. 1907, pp. 48–57*).—The history of investigations on this subject is reviewed, the advantages and disadvantages of soil and pure culture inoculation are discussed, and laboratory and pot experiments to determine the purity and efficiency of liquid cultures prepared and distributed by this Department are reported. The results obtained are briefly summarized as follows:

"Many of the cultures when received were devoid of live organisms of any kind.

"In multiplying the cultures, even under cleanly laboratory conditions, there is gross contamination by molds, yeasts, and foreign bacteria.

"In the pot experiments there was rarely any increase in the number of tubercles due to inoculation. The cultures here used were obtained directly from the National Department of Agriculture, and were fresh. They were probably of as good quality as is to be obtained and were presumably superior to the commercial cultures upon the market.

"While the number of tests here recorded is not large, it is to be noted that these tests were made under circumstances highly favorable to the cultures, and it is a reasonable supposition that failure would be more liable to occur in actual farm practice than in these pot tests.

"It therefore appears that the method of inoculation with liquid cultures, as at present prepared, is uncertain and unreliable, and not to be recommended as a substitute for the method of inoculation with soil containing the appropriate organisms."

Pure cultures for legume inoculation, K. F. KELLERMAN (*Science, n. ser., 28 (1908), No. 706, pp. 50, 51*).—The author takes exception to the conclusions reached by F. L. Stevens and J. C. Temple in the report of the North Carolina Experiment Station for 1907 (see above) regarding the low value of cultures for nodule-forming organisms of leguminous plants prepared by this Department, reports tests which do not bear out these conclusions, and calls attention to certain conditions which might explain the low results obtained in the North Carolina experiments.

Legume bacteria, S. F. EDWARDS and B. BARLOW (*Ontario Dept. Agr. Bul. 164, pp. 19, figs. 18*).—This bulletin summarizes reports of inoculation experiments by Canadian farmers during 1906 and 1907 with cultures prepared and distributed by the Ontario Agricultural College. During 1906, 375 cultures were distributed. From the farmers to whom these cultures were sent, 120 reports were received, of which 72 showed apparent benefit from inoculation, and 48 no benefit. In 1907, 372 cultures were distributed. Of the 124 reports received from which any conclusion can be drawn, 67 showed apparent benefit, 57 no benefit.

On the behavior of nitrate in paddy soils, G. DAIKUHARA and T. IMASEKI (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 7–36, pls. 2*).—It has been suggested that the low efficiency of nitrate of soda on paddy rice is due to the fact that rice grown on paddy soils is deficient in carbohydrates (sugars) necessary to the complete assimilation of the nitric acid. The authors found, however, no difference in sugar content of paddy and upland rice.

In laboratory studies of the rate of denitrification in humus soil, sandy loam, and heavy clay, it was found that denitrification was most rapid in the first two, but very slow in the third. Sterilizing the soils with steam, chloroform, or mercuric chlorid prevented formation of nitrites, thus indicating that the denitrification was due to bacterial action. The addition of organic compounds (sodium acetate or glycerin) greatly increased the rapidity of denitrification. Denitrification was also favored by the addition of starch, straw, rape cake, compost, etc. With well rotted rape cake and compost, however, reduction was much less than with the fresh materials.

The bacterial nature of the denitrification was confirmed by adding pure cultures of *Bacterium denitrificans* and *B. nitrovorum* to sterilized soils, and thus securing active denitrification.

The formation of nitrites went on very slowly in dry soils when only nitrate was added, but when organic matter (starch, rape cake, etc.) was added the rate of reduction was greatly increased.

Pot experiments on paddy and upland rice soils with nitrate alone or in combination with other fertilizing materials gave results confirming those obtained in the laboratory experiments and indicated that nitrate applied to paddy soils is reduced to some extent first to nitrite, then to ammonia and elementary nitrogen. The loss (largely as free nitrogen) from this source is increased by applying with the nitrate such fertilizers as fresh oil cake, straw, compost, etc., which supply organic matter which is easily assimilated by denitrifying bacteria. It therefore appears that nitrate of soda is not well suited to application as a fertilizer on paddy soils, and particularly in connection with other organic fertilizers. If such fertilizers must be employed they should be used only in well rotted condition.

On soil sickness, I. POUGET and D. CHOUCHAK (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 24, pp. 1200–1203; abs. in Rev. Sci. [Paris], 5. ser., 8 (1907), No. 25, p. 796; Rev. Gén. Agron., n. ser., 3 (1908), No. 1, pp. 1, 2; Chem. Zentbl., 1908, I, No. 7, p. 667*).—Observations on uncultivated soils and on those on which alfalfa had been grown are reported, the results indicating that the alfalfa plants excreted a toxic principle which, gradually accumulating in the soil, injuriously affects the growth of plants. These conclusions are drawn from studies of the effect of calcined and uncalcined aqueous extract of the alfalfa soil, the exact nature and properties of the toxic principles not being determined.

Results of experiments on the application of fertilizers and of a study of crop rotations, P. BUDRIN (*Resultatui Opuitov po Premyeneniyu Udobrenii i Izucheniyu Syevooborotov. St. Petersburg, 1907, pp. 188, illus.; rev. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 4, pp. 433–435*).—This report gives the results of experiments conducted during the last 12 to 15 years on the experiment field of the Institute of Agriculture and Forestry at Novo-Alexandria.

Under the local climatic and soil conditions green manuring, particularly with lupines, gave good results. The lupines were preferable under these conditions to vetches, being less exacting in their demands on the soil and in their moisture requirements. They also produced a larger mass of green matter. In fact, fall fertilizing with lupines on fallow gave more organic matter and nitrogen than the cereals could utilize completely. In some cases the leguminous plants gave as good results on cereals when grown for seed or hay and only the stubble plowed under as when the whole plant was so used. The author therefore recommends fall green manuring, especially for the more exacting crops, e. g., corn, root crops, fruits, and oil plants. Freedom of the field from weeds is essential to the success in green manuring, especially with lupines. Since the repeated use of green manures alone results in the exhaustion of the mineral constituents of the soil, mineral fertilizers, especially those supplying phosphoric acid and potash, should be used with the green manures. Whether phosphoric acid or potash will give the best results depends upon the nature of the plants grown.

Experiments with artificial fertilizers for sugar beets, F. LUBANSKI (*Sprav. List. Podolsk. Obshch. Selsk. Khoz., 1906, No. 3; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 4, pp. 441, 442*).—Some of the conclusions drawn from 6 years' cooperative experiments conducted by the Podolsk Agricultural Society are as follows: (1) Row application of fertilizers was most profitable; (2) all of the soils needed phosphatic fertilizers, some responding best to Thomas slag, others to superphosphate; (3) potash was best applied as a top-dressing at a later period than the other fertilizers; (4) clarification refuse from sugar factories applied in rows gave favorable results.

Comparative fertilizer experiments with nitrogen lime, lime nitrogen, nitrate of soda, and sulphate of ammonia for sugar beets, R. OTTO (*Deut. Landw. Presse, 35 (1908), No. 1, p. 1*).—In an experiment on light loamy sand during the comparatively warm and wet season of 1907 the best results were obtained with sulphate of ammonia, the next best with nitrogen lime, and the poorest results with nitrate of soda. It is suggested that the poor results with nitrate of soda were perhaps due to the washing out of this material from the soil.

Results of comparative fertilizer experiments with nitrate of soda and sulphate of ammonia, CLAUSEN (*Illus. Landw. Ztg., 27 (1907), No. 98, pp. 842–845, figs. 2*).—Experiments on a variety of crops and soils extending over a number of years are reported (E. S. R., 17, p. 448; 19, p. 320). The results show that the relative efficiency of nitrate of soda and sulphate of ammonia depends to a large extent upon the character of the season, but the author believes that the practical farmer will obtain a higher average efficiency for the sulphate than that given by Wagner, viz, 75 per cent that of nitrate of soda.

Action of calcium cyanamid on oats under different conditions, K. K. GEDROITZ (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 4, pp. 383–397*).—Pot experiments are described which were carried out in the agricultural chemical laboratory at St. Petersburg with oats grown on three soils, viz, a loamy chernozem, a sandy chernozem, and a strongly acid podzol. The action of calcium cyanamid was compared with that of pure calcium nitrate.

The results indicate that calcium cyanamid is not suitable for top-dressing, although thus applied it gave a slight increase of yield. The poorest results were obtained in all cases when the calcium cyanamid was mixed with the soil 2 days before sowing; the best results on the chernozem soils were obtained from mixing 7 days and on the podzol soil 14 days before sowing. In no case, however, did the yield of grain vary considerably with the length of time of application before sowing. The application of 0.3 gm. of nitrogen in the form of calcium cyanamid per pot (containing 5 kg. of soil) gave an increase in the yield of grain of 86 per cent that of calcium nitrate on the loamy chernozem, 85 per cent on the sandy chernozem, and 74 per cent on the podzol soil. The application of double the quantity of calcium cyanamid on the loam soil gave nearly double the increase of the yield. On the sandy and podzol soils the results were not so favorable.

Some observations on manuring with bone dust, S. UCHIYAMA (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 105–120, pl. 1*).—Sand and soil cultures with barley and soy beans in which bone dust was used in combination with various other substances are reported.

It was found that magnesite acted like limestone in depressing the availability of bone dust. Gypsum, even in slight excess, was beneficial. The phosphoric acid of the bone was not so readily available in the presence of sodium nitrate as in the presence of ammonium sulphate. When bone dust was used in combination with sodium nitrate there was little difference in yield whether the potash was applied in the form of sulphate, of carbonate, or of wood ashes. Potassium carbonate apparently rendered the phosphate of bone in part more available by conversion into potassium phosphate.

On the action and residual effects of Thomas-ammonium phosphate, BACHMANN (*Fühling's Landw. Ztg., 56 (1907), No. 24, pp. 875, 876*).—In a previous article (E. S. R., 18, p. 725) the author reported experiments showing the first year's effect on rye, oats, and meadow land of this material, which is a mixture of Thomas slag, ammonium sulphate, and sugar-factory lime waste containing in the sample experimented with 7.8 per cent of citrate-soluble phosphoric acid and 29.7 per cent of lime. In this article he gives the results of observations on the after-effect on the second year's crop of oats, as well as of further tests of the first year's effect of the material. Separate applications of Thomas slag, ammonium sulphate, and lime refuse, as well as of Thomas slag and ammonium sulphate, gave better results the first and second years than the Thomas-ammonium phosphate. It was further noted that there was a decided after-effect in case of ammonium sulphate alone.

Nitrate production of South America, A. A. WINSLOW (*Daily Consular and Trade Rpts.* [*U. S.*], *1908, No. 3069, p. 15*).—It is stated that "from 1830 until 1907 the nitrate fields of Peru and Chile have produced 36,443,327 tons of nitrate, valued at $1,112,728,765 United States gold.

"About two-fifths of this was produced during the last ten years. There has been much said about the exhaustion of the nitrate mines or beds, but from the best information obtainable they are good for two hundred or three hundred years, even at double the production, which is about 2,000,000 tons per year. Fully one-half the production has been net profit, but a new process has been invented that will do for the nitrate business what the cyanid process did for the gold production. Heretofore from 9 to 10 per cent has been left in the waste, but with the new process it is claimed that there will not be a loss of 2 per cent and at a less cost of production than by the old method. Even the waste or tailings can be worked with a great profit."

On the synthesis of ammonia from its elements. L. BRUNEL and P. WOOG (*Compt. Rend. Acad. Sci.* [*Paris*], *145 (1907), No. 22, pp. 922-924; abs. in Rev. Sci.* [*Paris*], *5. ser., 8 (1907), No. 23, p. 732*).—Small quantities of ammonia were produced by the catalytic action of oxid of nickel heated to 180 to 200° C. in a mixture of nitrogen and hydrogen. Continuous regeneration of the oxid of nickel and regular formation of ammonia was secured by suspending the oxid in and forcing a current of air and hydrogen through petroleum, boiling at 200 to 240° C. in a distilling apparatus, the vaporization of the petroleum preventing the temperature from rising, as a result of reduction of nickel sesquioxid to protoxid, to a point which would prevent the formation of ammonia.

Improvements in the production of ammonia (*Chem. Trade Jour., 41 (1907), No. 1075, p. 584*).—A description is given of H. C. Woltereck's process for the preparation of ammonia by passing air and steam over or through peat at a carefully regulated temperature.

New nitrogenous fertilizers, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 14 (1907), No. 33, pp. 201-204*).—This is a brief review of the latest practical information regarding progress in the manufacture and use as fertilizers of lime nitrogen and basic calcium nitrate in Norway, Sweden, Denmark, Germany, and France.

The utilization of the nitrogen of the air, L. GURWITSCH (*Naturw. Wchnschr., 22 (1907), No. 52, pp. 817-820*).—The importance of developing additional sources of supply of nitrogen for agricultural purposes is explained and the Birkeland and Eyde and the Frank and Caro processes are described, the first in considerable detail. It is estimated that under the conditions prevailing at Notodden a metric ton of nitrate of lime containing 13.2 per cent of nitrogen can be prepared by the Birkeland and Eyde process at a cost of about $19.

The preparation of nitric acid from the air by means of the electric flame, J. Moscicki (*Elektrotech. Ztschr., 28 (1907), Nos. 42, pp. 1003–1005, figs. 6; 43, pp. 1032–1035, figs. 5; 44, pp. 1055–1058, figs. 5; abs. in Electrochem. and Metallurg. Indus., 5 (1907), No. 12, pp. 485, 491–494, figs. 9; Sci. Abs., Sect. B Electrical Engin., 10 (1907), No. 120, p. 570*).—The older unsuccessful experiments with high-voltage, high-frequency discharges, and a new system of magnetic deflection of the electric arc, similar to that of Birkeland and Eyde, which has been successfully used by the author in a manufacturing plant in Vevey, Switzerland, are described.

The author uses a rotating arc the flame of which is produced between two vertical concentric copper electrodes and is rotated by magnetic lines of force parallel to the axis, spinning around in the annular space. The electrodes and electromagnets are cooled by water and oil. A direct current supplied by a compound dynamo at 1,500 volts or more is used. It is stated that only 1 per cent of the energy is absorbed in the auxiliary apparatus and that 525 kg. of nitric acid were obtained per kilowatt-year with the first laboratory furnace of 27 kilowatts.

The action of the electric spark on mixtures of nitrogen and oxygen at low temperatures, E. Briner and E. Durand (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 4, pp. 248–250; abs. in Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 23, pp. 1143, 1144*).—Studies of the action of the electric spark on $4N_2+O_2$ (air), N_2+O_2, and N_2+2O_2 in tubes cooled with liquid air and under different pressures are reported. The condensed product obtained was almost exclusively nitrogen peroxid. The process of oxidation served to produce first NO in the hottest region, then N_2O_3 in the coldest region, and finaly NO_2, which condenses on the walls of the apparatus.

Liquid air: Its manufacture and applications, G. Claude (*Rev. Sci. [Paris], 5. ser., 9 (1908), Nos. 24, pp. 737–745, figs. 8; 25, pp. 775–784, figs. 7; Ann. Soc. Agr. Sci. et Indus. Lyon, 1906, pp. 136–159, figs. 8.*)—This article gives the results of numerous experiments on the liquefaction of air, the preservation and properties of the liquid air, the extraction of oxygen, partial liquefaction, rectification, and application of the oxygen.

Lime nitrogen, nitrogen lime, and lime niter, E. Grabner (*Wiener Landw. Ztg., 57 (1907), No. 80, pp. 753, 754*).—This article briefly summarizes the more important information regarding the composition, properties, and agricultural value of these substances.

Apparent loss of nitrogen from lime nitrogen, R. Riecke (*Chem. Ztg., 31 (1907), No. 73, p. 905; abs. in Chem. Abs., 2 (1908), No. 1, p. 159*).—It is stated that the apparent losses of nitrogen from lime nitrogen are explained by increase of weight due to absorption of carbon dioxid and water from the air, which are not usually taken account of in the calculations of percentage.

Calcium cyanamid (*Engin. and Min. Jour., 84 (1907), No. 21, p. 976; Chem. Trade Jour., 41 (1907), No. 1075, p. 582*).—A list is given of cyanamid works in course of construction in Europe.

The problem of potash salts in Italy, I. Ceruti (*Indus. Chim., 7 (1907), pp. 281–283; abs. in Chem. Zentbl., 1907, II, No. 25, p. 1993*).—On the basis of examinations of sea water and of the mother liquors from salt works the author suggests the domestic manufacture of potash salts for fertilizing purposes as a substitute for imports from Germany. He found in the water of the Gulf of Porto Farrajo 0.7 gm. of potassium chlorid and in the mother liquors of salt works of that region 44 gm. of potassium chlorid per liter. The author recommends the establishment of such an industry in Sicily, where no monopoly exists.

Phosphate mining in Tennessee, H. D. RUHM (*Engin. and Min. Jour., 85 (1908), No. 3, pp. 153, 154, figs. 4*).—Progress in the installation of new works and in the mining of phospates during 1907 is reviewed. It is stated that in spite of the fact that prices were high the total production of the Tennessee field was not more than 400,000 tons. As high as $6.75 per ton was obtained for 75 per cent phosphate for domestic use and $8 per ton for 78 per cent phosphate for export during the year.

Limestones available for fertilizers, F. B. VAN HORN (*Ill. Geol. Survey Bul. 4, pp. 177–183, fig. 1*).—Analyses of 10 samples from southern Illinois are reported, 7 of which were of sufficient purity probably to warrant their exploitation for fertilizing purposes.

Tomato refuse, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 69, 70*).—An analysis of the dried refuse from tomato canneries is reported, showing 2.54 per cent of nitrogen, 3.28 per cent of phosphoric acid, and 0.61 per cent of potash. Assuming 75 per cent of moisture for the material as it leaves the factory, the amounts would be, nitrogen 0.64 per cent, phosphoric acid 0.82 per cent, and potash 0.16 per cent, a composition comparing favorably with that of barnyard manure.

On the composition of different kinds of sugar factory clarification refuse, W. GABEL (*Ztschr. Ver. Deut. Zuckerindus., 1907, No. 622, II, pp. 989–993; abs. in Chem. Ztg., 31 (1907), No. 96, Repert. No. 88, p. 595*).—Methods of analyzing this material are briefly described and analyses of 4 different samples are reported. In these the water varied from about 21 to 50 per cent, the nitrogen from 0.2 to 0.25 per cent, the phosphoric acid from 0.85 to 0.95 per cent, and the potash from 0.02 to 0.08 per cent. It was found that fermentation of the refuse with wash water from the cossettes did not result in any loss of fertilizing material. In fact there seemed to be a slight gain due to the assimilation of the nitrogen of the wash water by micro-organisms and precipitation of the compounds thus formed by lime.

Ash constituents of [sugar beets and] beet pulp, W. P. GAMBLE (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907, pp. 81–84*).—Analyses are reported which show that the dry matter of the crown portion of a representative sample of sugar beets contained 6.92 per cent of ash, the factory portion 5.68 per cent. The factory portion of the beets contained 1.87 per cent of nitrogen in dry matter. The average of 2 analyses of sugar-beet pulp showed 4.28 per cent of ash and 1.62 per cent of nitrogen in dry matter. From these data the conclusion is drawn that there is "little difference between the ash content of the crown and the factory portion" of sugar beets, and that "the sale of sugar beets without returning the beet pulp is very exhausting on the soil."

Dried meat, P. MARSAIS (*Rev. Vit., 28 (1907), No. 725, pp. 524–526; abs. in Rev. Sci. [Paris], 5. ser., 9 (1908), No. 1, p. 19*).—The value of this material as a fertilizer, especially for vineyards, is discussed, and the "tanking" and composting (with lime and earth) of dead animals and other refuse animal matter are briefly described. The high value of meat fertilizers, especially as carriers of readily available organic nitrogen, is recognized and their more extended use in France is predicted and recommended.

The utilization of abattoir by-products at Islington (*Meat Trades' Jour., 27 (1908), No. 1028, p. 49, fig. 1*).—The process of tanking condemned meat employed at this place is briefly described.

Commercial fertilizers, J. S. Burd (*California Sta. Bul. 194, pp. 161–183*).—The results of fertilizer inspection in California during the first half of the fiscal year 1907–8 are reported in this bulletin. Of the 241 samples examined, 56 were deficient in one or more of the fertilizing constituents guarantied. "According to the sworn returns of dealers registered for the fiscal year ending June 30, 1907, their entire sales in the State amounted to 21,647 tons."

Inspection and analyses of commercial fertilizers on sale in the State, W. F. Hand et al. (*Mississippi Sta. Bul. 105, pp. 54*).—The results are reported of analyses of 506 samples inspected during the season of 1906–7.

Inspection of commercial fertilizers, H. J. Waters (*Missouri Sta. Bul. 77, pp. 14*).—This bulletin contains a report of analyses of commercial fertilizers collected during the fall of 1906 and also a financial statement of the fertilizer control for the year 1906.

Inspection of commercial fertilizers, P. F. Trowbridge (*Missouri Sta. Bul. 78, pp. 14*).—This bulletin gives the results of analyses of samples of commercial fertilizers collected during the season of 1907 with a financial statement for the same year.

The inspection of commercial fertilizers in 1907, F. W. Morse and B. E. Curry (*New Hampshire Sta. Bul. 134, pp. 77–84*).—This bulletin reports analyses of 106 samples, representing 94 brands of fertilizers, examined by the station for the State board of agriculture. "Twenty brands were deficient in one or more constituents to an extent which would lower their value below that of the guaranty."

The calculation of equivalent manurial values, G. C. Phillips (*Mark Lane Express, 97 (1907), Nos. 3978, p. 772; 3979, p. 798; 98 (1908), Nos. 3980, p. 10; 3981, p. 34*).—This article discusses the practical use of the tables compiled by Lawes and Gilbert and revised by Voelcker and Hall as a basis for paying outgoing tenants for fertility added to the soil in form of purchased feeds, etc., during their incumbency of the land. The data given in these tables are presented in a different form by the author, who discusses in some detail their use under a variety of conditions. The compensation for fertility added to the soil by a tenant is required in England by parliamentary act of 1883, amended in 1906.

AGRICULTURAL BOTANY.

Heredity and environic forces, D. T. MacDougal (*Science, n. ser., 27 (1908), No. 682, pp. 121–128*).—In this paper, which was given as an address before the section of botany of the American Association for the Advancement of Science, the author presents an account of his experiments in influencing variation in plants by the injection of chemical solutions into the ovaries of the plant prior to the fertilization of the flowers. His preliminary results, which have already been noted (E. S. R., 17, p. 1147), were so striking that the experiments have been continued and extended.

In 1906 experiments were conducted on *Œnothera biennis*. Of the various test plants, one, which had been treated with a solution of zinc sulphate, produced a seed which developed into a plant strikingly unlike the parent plant, and has since transmitted its new characteristics through 3 generations.

Experiments were afterwards carried on with 9 species representing 7 genera of plants, which were found growing naturally about the Desert Laboratory near Tucson. These were injected with solutions varying from 1 : 250 to 1 : 50,000 of calcium nitrate, potassium iodid, zinc sulphate, and methyl blue. Over 100,000 seeds were harvested from the treated ovaries of the different plants, some of which were sown in August, 1907. As many of the species developed slowly, the author was not prepared to make any definite announcement except to say that among the seedlings of Cereus are several which seem far from being typical.

The principal portion of the paper is taken up with a discussion of the mechanics involved by the treatment.

Mutation and traumatisms, L. BLARINGHEM (*Mutation et Traumatismes. Paris, 1908, pp. 248, pls. 8*).—This is a study on the evolution of plant forms, the principal observations having been made upon maize. The first part of the work deals with the causes that induce metamorphosis in the sexual organs, in the second part applications are made to other plants of the phenomena found in maize, while in the third part the transmission of the anomalous characters observed in the floral organs of maize is discussed at length.

The author describes a number of new forms that were derived from a single mutilated plant in 1902. This plant showed in the staminate panicle numerous changes from the normal type, which were transmitted and reproduced new types in a way similar to that described by de Vries for his mutations. Similar results have been obtained by the author with barley and white mustard, showing that mutilation is an important factor in the evolution of plant forms.

The influence of the form of carbon upon the morphology of Penicillium cultures, C. THOM (*Abs. in Science, n. ser., 27 (1908), No. 684, p. 211*).—The author calls attention to cultures of 11 species of Penicillium to illustrate the wide difference in morphology produced by changing the source of carbon in synthetic culture media. For comparison the species were grown upon potato agar and then upon synthetic agar in which the carbon was presented in the form of sucrose, lactose, glycerin, alcohol, and tartaric acid. Repeated cultures showed that the form of carbon produced very marked differences in metabolism, in morphology, and in the formation of pigments, crystals, etc., in the substratum.

Hydrocyanic acid and nitrogen assimilation by green plants, C. RAVENNA and A. PELI (*Gaz. Chim. Ital., 37 (1907), II, No. 6, pp. 586-600*).—The author has made a study of the presence and formation of hydrocyanic acid in sorghum, and finds that it is due to the direct and simultaneous action of carbohydrates and nitrates in the plant. If these are withdrawn the amount of hydrocyanic acid decreases rapidly. The effect of light is to increase the hydrocyanic acid, providing that it does not in any way interfere with photosynthesis.

Effect of exposing germ cells to the rays of radium, C. S. GAGER (*Abs. in Science, n. ser., 27 (1908), No. 687, pp. 335, 336*).—The author describes the effect as shown on the first generation of plants grown from seeds, the sperm cells of which had been exposed to radium during their development.

In growing some of the plants showed a lack of symmetry in that one side of the plant grew more rapidly and vigorously than the other, although the plants were subjected to perfectly uniform conditions. On one side the leaves possessed the characteristics of some of the mutants of *Onagra biennis*.

One plant produced two shoot systems from one root, one of which was typical of *O. biennis*, the other of one of its mutating forms. This plant and the asymmetrical ones described above are believed to be a form of bud sports that indicate a hybrid nature of the plants thus sported.

Effects of radium rays on mitoses, C. S. GAGER (*Abs. in Science, n. ser., 27 (1908), No. 687, p. 336*).—An abstract is given of a paper in which the effect of radium rays on the root tips of onions was described. An exposure to the strongest radium (1,500,000 activity) completely inhibited nuclear division. With less active preparations and varying lengths of exposure, important disturbances in the chromosomes were noted. It was frequently observed that some of the chromosomes failed to pass the poles and consequently were not included in the formation of the daughter nuclei. This elimination of chromatin it is believed will explain some of the morphological changes that are described as following exposure of the fusing gametes to the rays.

The toxic action of certain organic plant constituents, O. SCHREINER and H. S. REED (*Bot. Gaz., 45* (*1908*), *No. 2, pp. 73-102, figs. 7*).—The result of a study on the toxic action of certain compounds which, with few exceptions, occur naturally in plant tissues is given. A large number of compounds were employed, the solutions being made up on the basis of a certain number of parts of the compound per million of physiologically pure water. The experiments were carried on with wheat seedlings, the effect of the compounds on transpiration, green weight, and turgidity, as well as upon the condition of the root tips being noted.

The data presented show that a number of the compounds occurring naturally in plants have toxic effects upon wheat seedlings. The amino-acid compounds display a relatively low toxicity, with the exception of tyrosin and aspartic acid, which have a relatively high toxicity toward plants. The physiological action of neurin, cholin, and betain shows that with an increase in oxygen there is a decrease in their toxicity. The pyridin compounds employed were all toxic, some of them being fatal to wheat plants in relatively small amounts. Pyridin itself appeared to be relatively less toxic than any of its related compounds. The phenol compounds studied displayed varying degrees of toxicity, and their poisonous properties did not appear to depend upon the number of hydroxyl groups they contained.

While the authors do not claim that there is a decrease in toxic action due to the introduction of oxygen into organic compounds, yet in a number of cases the more highly oxygenated compounds were found less toxic than those containing less oxygen. In some instances a stimulating effect was noted where very dilute solutions were used. This is accounted for by the possibility that when toxic agents are present in small amounts they excite the cells to greater activity, as a result of which the cells are able to utilize more fully the materials at their disposal, or to overcome retarding conditions of their environment. The authors have shown that deleterious waste products are excreted from living plants, and if these products be of the nature of proteids, beneficial conditions may arise by the continual precipitation of the harmful excretions. It is further suggested that the stimulation of plant growth by small quantities of toxic agents may consist in the removal of deleterious waste products and the maintenance of a sanitary environment for the growing plant.

Among the substances employed some appeared to have a toxic action mainly upon the growth of the tops of the plants, while others were more toxic to the growth of the roots than to the tops.

A bibliography is included.

The antitoxic action of magnesium and potassium, W. J. V. OSTERHOUT (*Bot. Gaz., 45* (*1908*), *No. 2, pp. 117-124, figs. 3*).—The investigations of the author which showed that potassium may inhibit more or less fully the poisonous effects of magnesium having been criticised (E. S. R., 19, p. 323), the author has repeated his experiments, covering a wide range of plants. These included some marine algæ, fresh water algæ, wheat seedlings, and cuttings of Tradescantia and beet roots, and in addition to the chlorids used in the previous experiments, the author introduced sulphates and nitrates.

The results obtained showed that the magnesium salts and potassium salts used separately were poisonous to plants, but when mixed together in suitable proportions the poisonous effects more or less completely disappeared.

The effect of fungicides upon the assimilation of carbon dioxid by green leaves, A. AMOS (*Jour. Agr. Sci., 2* (*1907*), *No. 3, pp. 257-266*).—A series of experiments is reported in which Bordeaux mixture was sprayed on hops, grapes, and Jerusalem artichoke, and flowers of sulphur distributed on the artichoke leaves. In addition a tabulation is given of experiments with a number of other species of plants.

The results show that the application of Bordeaux mixture to the leaves of a plant diminishes the assimilation of carbon dioxid by these leaves for a time, after which this effect passes off, as observed in the series where the leaves were beginning to age, as well as in those where they still remained vigorous. It seems probable that the stomata are partially blocked up by the presence of the Bordeaux mixture, and that, as a consequence, less air diffuses into the intercellular spaces of the leaf and less carbon dioxid comes in contact with the absorption surface.

Experiments on the effect of flue dust on soils and plants, E. HASELHOFF (*Landw. Vers. Stat., 67 (1907), No. 3-4, pp. 157-206, pls. 2; abs. in Deut. Landw. Presse, 34 (1907), No. 95, p. 746, figs. 2; Chem. Zentbl., 1907, II, No. 21, pp. 1755, 1756; Jour. Chem. Soc. [London], 92 (1907), No. 541, II, pp. 905, 906*).—A study was made to determine the effect on soils and plants of the flue dust from a considerable number of manufacturing establishments, including brick kilns, blast furnaces, various chemical works, etc., where both stone and lignite coal were used as fuel. The effect of the flue dust on the soils and also on plants grown in soils and where the dust was placed directly upon the plants was investigated by means of pot cultures, using barley, rye, beans, and mustard.

The composition of the flue dust varied greatly, even when similar qualities of fuel were used. The injurious constituents were found to be mainly chlorids, sulphids, and probably sulphates. The presence of the flue dust in the soil was found greatly to retard germination, and when placed on the growing plants the foliage was seriously injured. The effect on the plants seems to be indirect when the flue dust falls upon the soil and direct when it falls upon the leaves. In the first case the greatest injury will follow sodium sulphid falling on soils favorable to the production of hydrogen sulphid. When applied directly to leaves the different materials interfere with the function of the leaves, modify their structure, and check their development. The greatest injury is done by sodium sulphid, followed by sodium sulphate, and then by calcium sulphid.

A microscopical examination of the foliage will show striking injury, but nothing that can be taken as typical of the kind of compound causing it. A chemical analysis of the diseased plant, it is claimed, will give indications regarding the nature of the substances which cause the injury.

FIELD CROPS.

Experimental work in field husbandry, C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 168-179, 181-226, figs. 11*).—About 50 acres of land divided into somewhat over 2,000 plats is devoted to this line of work, much of which is in continuation of that previously reported (E. S. R., 19, p. 25). In addition to reporting the results secured on these plats the author discusses briefly the production of farm crops in Ontario and calls attention to the fact that barley surpasses oats in yield of grain per acre by nearly 100 lbs. per annum in the average of 25 years.

In comparing the grain-yielding capacity of different crops it was found that on an average for 6 years common emmer ranked first with 2,756 lbs., followed by Mandscheuri barley with 2,715 lbs., and Joanette oats with 2,559 lbs. per acre. In an 18-year test of 4 varieties each of barley, oats, and potatoes, and an 11-year test of winter wheat, the highest yielding varieties were, respectively, Mandscheuri barley with an average yield of 70.9 bu. per acre, Joanette oats with 88.6 bu., Empire State potatoes with 223.7 bu., and Dawson Golden Chaff winter wheat with 54.6 bu.

In each of 5 years the first seeding of oats, barley, spring wheat, and peas was made when the land was warm and dry enough to work to good advantage, and several seedings at intervals of 1 week were made after this date. The best yields of grain and straw per acre were obtained from the first date of seeding with spring wheat and barley and from the second date with oats and peas. For every day's delay in seeding after the first week there was an average decrease of 56 lbs. of oats, 53 lbs. of barley, 29 lbs. of spring wheat, and 23 lbs. of peas per acre. A similar test with emmer and spelt also showed that in each case emmer held the superior record in grain as well as in straw production. Winter wheat has in general given the best results when sown between August 26 and September 9. In a test with different quantities of flaxseed per acre the best yield, 2.5 tons of straw and 21.1 bu. of grain, was secured from the use of 2 bu. of seed.

Where field peas were used as a green manure for the preparation of land for winter wheat an average of about 6.5 bu. more wheat per acre was secured than where buckwheat was plowed under. Thoroughly ripened winter wheat produced a greater yield of both grain and straw and a heavier grain, as shown by 7 years' work, than wheat cut at any of the four earlier stages of maturity.

Barley and oats grown as a mixed crop gave in 1907 the highest yield of grain, 1,979 lbs. per acre, where 4 pk. of each were used per acre. The mixture of Mandscheuri barley and Daubeney oats has been found to ripen well together and to produce a large yield of grain. The results with crop mixtures of 12 and 8 kinds of grain, in combinations made up of uniform weights of seed or of quantities in the same proportion as when the crops are grown separately, showed the supremacy of Mandscheuri 6-rowed barley when used in this way. In the average of 6 years' work and the results of 24 tests this variety represented 17.6 per cent in the mixture.

Within the past 19 years 295 varieties of oats have been tested at the college and 59 varieties have been compared in each of the past 5 years. Among these Yellow Russian, Vick American Banner, and New Zealand ranked first in grain production with respectively 102 bu., 101.9 bu., and 99.4 bu. per acre as an average for 5 years. Hulless, the lowest ranking variety, yielded 56.2 bu., and 31 varieties of the 59 yielded over 90 bu. per acre. Varieties possessing the stiffest straw in 1907 were Liberty, Daubeney, Banner, Kherson, Early Champion, and Siberian.

The highest yield of 6-rowed barley in 1907 was produced from a special strain originated from a selection from the Mandscheuri barley originated at the college in 1903. The college has produced a considerable number of hybrid barleys by using the Mandscheuri as one of the parents. Of 6 varieties of 2-rowed barleys grown for 14 years in succession 2-rowed Canadian, Jarman Selected Beardless, and New Zealand Chevalier ranked first in yield with 64.6, 63.8, and 62.2 bu. per acre, respectively. Of the hulless varieties grown for 14 years in succession, Guy Mayle ranked first with 48.3 bu., Purple second with 45.4 bu., and Black Hulless third with 44.9 bu. The last-mentioned variety is the most extensively grown throughout Ontario. Winter barley at the college for 11 years has given an average yield of 56.5 bu. of grain and 1.3 tons of straw per acre. In 1907, of 3 winter varieties, Tennessee was the most productive, yielding 53.4 bu. per acre. During the past 14 years winter barley has been completely killed out on three occasions.

About 250 varieties of winter wheat have been tested at the college during the past 18 years. Among a number of varieties grown for 12 years Dawson

Golden Chaff ranks first, with an average yield of 56.4 bu., followed by Imperial Amber, Early Genesee Giant, and Russian Amber, with 52.8, 52, and 51.4 bu. per acre, respectively. The heaviest weights of grain per measured bushel in a 5-year test were produced by Economy, Geneva, Tasmania Red, Banatka, Kentucky Giant, and Crimean Red, the weight in all cases being between 61 and 62 lbs. Baking tests were made and show that the best varieties in furnishing good flour for bread were Tasmania Red, Rudy, Onigara, Crimean Red, Yaroslaf, Turkey Red, Early Genesee Giant, Banatka, Northwester, Geneva, Imperial Amber, Tuscan Island, Kentucky Giant, and Michigan Amber, all red wheats with the exception of Early Genesee Giant. Most of these wheats, however, are comparatively weak in the straw and rather light in yield. It is stated that in general white wheats yield more grain per acre, possess stronger straw, weigh a little less per measured bushel, are slightly softer in the grain, produce a more popular pastry flour, and furnish a somewhat weaker flour for bread than the red grains.

The heaviest yielders among spring wheat varieties, with their yields, were as follows: Carleton 42.8 bu., Preston 36.5 bu., Hungarian 36.2 bu., Herison Bearded 35.9 bu., and Minnesota No. 163 35 bu. per acre. The average yields per acre of 6 varieties of macaroni wheat grown for 15 years were as follows: Wild Goose 39.2 bu., Medeah 34.9 bu., Bart Tremenia 34.3 bu., Sorentina 33.2 bu., Algiers 32.3 bu., and Ontario 23.6 bu. Polish wheat in 1907 produced only 18.7 bu. per acre.

The results of variety tests of a large number of other crops are given. The leading variety of each crop and its yield per acre in 1907 was as follows: Spring rye, Saatroggen 36.5 bu., Mammoth White winter rye 67 bu., Farmers Surprise corn 67.9 bu., Rye buckwheat 31 bu., Siberian millet 51.5 bu., Dwarf broom corn 31 bu., Multipliers field peas 51 bu., Garton Improved Yellow Globe mangel 44.6 tons, Imperial Giant Half sugar beet 21.7 tons, Sutton Magnum Bonum swede 21.5 tons, Red Top White Globe fall turnip 35.3 tons, Earliest Erfurt kohl-rabi 31.3 tons, Steel Improved Short White carrot 44.3 tons, Kenney Improved Amber sugar cane 24.2 tons, Black Giant sunflower 6.3 tons, Japanese Panicle and Japanese Common millet 3.5 tons of hay, Sutton Earliest Drumhead cabbage 24.8 tons, and Medium Green soy beans as compared with other leguminous crops 9.4 tons of green fodder.

The leading variety of flax in Manitoba has produced an average yield of 21.3 bu. of seed per acre for 3 years, the leading variety of sorghum, California Golden, 31.1 bu. in the average of 5 years' results, and the leading variety of sunflowers, White Beauty, 72.6 bu. in the average of 9 years. Among varieties of field beans as shown by 9 years' work Pearce Improved Tree, White Wonder, Medium or Navy, and Burlingame Medium have been most satisfactory. Cowpeas did not mature in 1907 and grass peas produced only about 16.4 bu. per acre. During the past 6 years the yields of hairy vetches have ranged from 1.5 to 18.2 bu. of seed per acre. In each of 4 years decidedly better results were secured from Canadian-grown vetch seed than from imported seed. For a 5-year period New Ideal Hollow Crown parsnips ranked first with an average yield of 11.9 tons per acre, and in the average results of 5 years' experiments with corn for fodder and silage Pennsylvania Early Dent produced 27.37 tons of total green crop per acre and was the leading variety in the list.

Of 111 varieties of potatoes tested this season the following varieties are among the best when yield, size, freedom from rot, and quality are considered: Late—Empire State, Dempsey Seedling, Rural New Yorker No. 2; medium—Rose of the North, Burpee Extra Early; early—Early Fortune, Early Harvest, Extra Early Eureka, and Early Dawn. The results of planting potato sets of different sizes and at different distances were in favor of 2 oz. sets planted

12 in. apart or the heaviest sets planted the closest together. Planting one set per hill has given the best average results for 8 years.

[Field crops], J. W. Fox (*Mississippi Sta. Bul. 106, pp. 2–6*).—The work with field crops here reported was conducted at the Delta station in 1906. Of 16 varieties of cotton, Cook Improved and Moss Improved ranked first in the 1 in. staple class, with an average yield of 560 lbs. of lint cotton per acre, Triumph and Lewis Prize Prolific first in the 1⅛ in. staple class with 550 lbs. of lint cotton, Southern Hope and Black Rattler in the 1³⁄₁₆ to 1¼ in. staple class with 350 lbs. of lint cotton, and Sunflower and Allen in the 1⅜ to 1½ in. staple class with 340 lbs.

It was found that on old Delta land receiving from 300 to 500 lbs. of cotton-seed meal per acre a variety of cotton not a rank grower gave the best results during a moderately dry season when planted in 4 ft. rows and 2 ft. apart in the row.

From the results of fertilizer tests it appeared that nitrogen was the only element needed and that this could be applied to light lands in cotton very profitably. Phosphoric acid or potash gave no increase in yield when applied to cotton, corn, or cowpeas. The yield of seed cotton per acre was increased from 960 lbs. to 1,500 lbs. by the use of 450 lbs. of cotton-seed meal.

A comparison of different forage crops showed that alfalfa sown the preceding fall yielded 6,300 lbs., red clover 5,800 lbs., fall sown oats 5,200 lbs., and peas after the oats were cut 3,500 lbs. of hay per acre. It is reported that alfalfa has been successfully grown on all the stiff or buckshot lands, but that it has not done well on light sandy lands. An average yield of 41 bu. of corn per acre was secured under ordinary field conditions.

Experiments with cotton and corn in 1906, J. F. DUGGAR and J. M. RICHESON (*Alabama Canebrake Sta. Bul. 24, pp. 21*). Weather conditions interfered to some extent with the experiments here reported. Six varieties of cotton grown on bottom land ranked in the value of lint and seed per acre in the following order: Toole, Cook Improved, Russell, Truitt, Hastings Improved, and Culpepper. The value of the lint and seed ranged from $36.34 to $51.56 per acre. The average results of 4 years are in favor of plowing 6½ in. deep, as compared with 4½ and 3½ in. Leaving 1 plant per hill 3 and 4 ft. apart, or a total of 3,568 plants per acre, gave 192 lbs. of lint, while an acre of drilled cotton with 6,112 plants yielded 256 lbs. The yield per plant on the check plat was 0.053 lb. of lint and on the drilled plat 0.042 lb.

Plowing under the entire growth of cowpeas apparently increased the yield of lint cotton per acre by 272 lbs. Corn following a poor stand of alfalfa gave 11 bu. per acre more than the check test. In a rotation test it was found that by plowing under melilotus stubble or the entire growth of cowpeas sown in the preceding crop of corn at the last cultivation the following crops of corn and cotton were greatly increased.

Three years' fertilizer experiments on reddish prairie land showed that cotton-seed meal and nitrate of soda were applied to cotton at a decided profit either alone or in combination with acid phosphate. The use of acid phosphate was usually profitable, but the use of kainit was almost uniformly unsatisfactory. Cotton-seed meal and kainit were applied at the rate of 320 lbs. per acre, and acid phosphate at the rate of 324 lbs. The average increase of lint cotton per acre with cotton-seed meal was 88 lbs., and with acid phosphate 8 lbs., whereas with kainit there was an average decrease of 13 lbs. On white prairie land both cotton-seed meal and acid phosphate were profitable for cotton, but the results with kainit were again doubtful. On black slough land little or no increase from any fertilizer for cotton was obtained. An intensive application of fertilizers for cotton, consisting of 200 lbs. each of kainit, acid phosphate, cotton-seed meal, and nitrate of soda, gave an average increase for 3 years of 257 lbs. of lint per acre. In this experiment the annual profit per acre averaged $18.97 more than the profit on unfertilized land.

Experiments with cotton and oats in 1907, F. D. STEVENS (*Alabama Canebrake Sta. Bul. 25, pp. 16*).—The results of numerous experiments are briefly reported.

Different methods of preparing black slough prairie soil for cotton resulted in an increase in returns of $4.13 per acre in favor of plowing 6½ in. deep as compared with plowing 4½ in. deep. Bedding in March gave better results than bedding in December. California bur clover and crimson clover used as green manures proved more profitable than commercial fertilizers. Truitt cotton gave the best yield of lint and seed on black slough bottom land and Peterkin, which ranked second, produced the highest percentage of lint. Where cotton was alternated with corn for 5 years the yields remained practically constant, but where cowpeas were sown broadcast in standing corn and turned under the yields were gradually increased. Oats after red clover yielded 51.8 bu. per acre, after white clover 43.1 bu., and when fertilized with 200 lbs. of nitrate of soda 53.7 bu. per acre were secured.

The use of 200 lbs. each of cotton-seed meal, nitrate of soda, acid phosphate, and kainit for 4 years on dark gray hillside land, as compared with the use of no fertilizer for cotton, gave an average profit of $14.53 per acre per year. Another fertilizer test showed that for cotton on galled white or gray prairie land an application of 200 lbs. of cotton-seed meal and 240 lbs. of acid phosphate per acre may be recommended. On medium grade prairie soil from 200 to 350 lbs. of cotton-seed meal with from 250 to 375 lbs. of acid phosphate per acre was most satisfactory. Kainit, except when used alone, was detrimental. On dark red prairie bottom land 160 lbs. of nitrate of soda, 240 lbs. of acid phosphate, and 200 lbs. of cotton-seed meal alone or in combination have been of exceptional value.

Report of the chemical division, W. A. WITHERS (*North Carolina Sta. Rpt. 1907, pp. 13, 14*).—The work of the division for the year is briefly outlined. The experiments carried on with sweet potatoes confirm the results of Stone as to the presence of cane sugar and the absence of reducing sugars, and further show the absence of pentosans and pentoses. It is concluded from these experiments that the sweet potato may be used directly for the production of alcohol instead of taking the usual step of first separating out the sugar and starch.

A note on nitrification work carried on states that while at the beginning of the work it was found possible to produce nitrates in soils from nearly every soil tested, during the last year or so these same fields and gardens have failed to produce nitrates thus indicating the instability as well as the lack of wide distribution of the organism. When some very rich soils were taken, however, the formation of the nitrates was again secured. In some cases it was found that an attempt to cultivate the organism resulted in a lack of production of nitrates. Work is now in progress to cultivate and isolate the different organisms in the soils referred to, with the view of ascertaining those which produce nitrates.

Range conditions, J. J. THORNBER (*Arizona Sta. Rpt. 1907, pp. 226–228*).—During the year ended June 30, 1907, the total precipitation on the small range reserve was 13.02 in., of which 7.20 in. fell during the winter rainy period. While the stands of Indian wheat and alfilaria were excellent, the growth was only from 2 to 3 and from 5 to 6 in., respectively. Of 15 varieties of seed sown June 28, 1906, on land occasionally flooded only alfilaria made sufficient growth to warrant mentioning.

One-half acre or less of each of the following varieties of cacti were planted in March, 1907: *Opuntia arbuscula, O. engelmanni, O. phœacantha, O fulgida, O. mamillata,* and *O. spinosior.* The cuttings this year were about double the size of those planted in past years, and generally of older growth. The method of planting was the same as that used last year, but the cutting was set deeper in the ground. Growth apparently began soon after planting and continued throughout a favorable summer. Many of the plants grew from 12 to 18 in. in height and produced a good number of lobes. December 31, 1907, these plants averaged at least twice the size of those of corresponding plats set 1 year earlier. Of a number of different species of saltbushes planted *Atriplex semibaccata* was the only one making a fair growth. On June 28, 1906, a patch of rayless golden rod (*Isocoma hartwegi*) was burned over and all the plants, even those only partly charred, were killed outright, as were also such other shrubs as the catclaw, creosote bush, Brigham tea, mesquite, and Zizyphus. Cutting the rayless golden rod about 2 in. above ground destroyed about 50 per cent of the plants, but cutting somewhat below the surface of the ground destroyed all.

Cultivation of small grains, E. G. Montgomery (*Nebraska Sta. Bul. 104, pp. 1-19, fig. 1*).—The average of 7 years' work shows that where drilled oats were cultivated in comparison with uncultivated drilled oats there was an increase in yield of 4.8 bu. per acre. The cultivation consisted usually of 1 to 3 harrowings given about 4 to 6 weeks after sowing. During 4 years drilled oats gave an average increase of 5.3 bu. per acre when cultivated, while broadcast oats decreased in yield 1.9 bu. per acre. It was thought that in broadcast oats a larger number of plants were either destroyed or injured by the cultivation than was the case with the drilled oats.

Cultivating winter wheat with the harrow or weeder did not increase the yield. The greatest benefits in cultivating small grains were derived during dry years, while in seasons of more than normal rainfall cultivation sometimes decreased the yield. In a 4-year experiment with cultivating broadcasted wheat there was an average loss of 3 bu. per acre, while where the wheat was drilled the loss was only ½ bu. per acre. It was found that drills over 6 in. apart were too wide apart except under exceedingly dry conditions when 12 in. drills served best. Rolling winter wheat in the spring gave an average increase for 4 years of 5.1 bu. per acre.

Kherson oats gave the best results when sown at the rate of 8 pk. per acre, but this did not prove true of other varieties. The Kherson oat plant tillers freely when sown thinly, but few tillers were formed when 12 or more pecks per acre were sown.

Alfalfa or lucern, C. A. Zavitz (*Ontario Dept. Agr. Bul. 165, pp. 15*).—This bulletin contains a discussion of alfalfa culture and a review of the results secured with alfalfa in the field and on experimental plats at the Ontario Agricultural College for a series of years. As an average for 10 years, 21.67 tons of green crop and 5.27 tons of hay were obtained. The average dates of cutting were June 21, August 2, and September 21. In a comparison of seed from different sources the greatest yield of cured hay per acre was produced by seed from northwestern Texas, but the yield of green crop was greatest from Turkestan seed. A comparison of barnyard manure and hen manure for alfalfa showed that the influence of the hen manure was quite marked at first, but that the barnyard manure was more lasting.

In making observations on the influence of alfalfa roots on the soil it was observed that alfalfa sod is more difficult to plow than the sod of clover, timothy, fescue, or orchard grass, but that the inverted sod is in a looser and more friable condition than the sod of these other crops. In growing alfalfa with other crops the greatest yield was produced where it was grown with tall oat grass.

Alfalfa breeding: Materials and methods, H. F. Roberts and **G. F. Freeman** (*Kansas Sta. Bul. 151, pp. 79–109, figs. 15*).—The range of variation in alfalfa plants and the opportunities for plant improvement are pointed out in discussions on the general habit, the leaf characters, the variation in the color of the flowers, and the differences in physiological characters. These discussions are based on observations made on selected individual plants with which breeding work was begun in the spring of 1906.

A severe freeze on March 23 affected plants of Turkestan and American alfalfa very differently. The American was badly injured and the whole field took on a brown appearance after the frost-killed stems had commenced to dry, while the Turkestan alfalfa on an adjoining plat at the same elevation was little or not at all injured. In both plats, however, exceptions were found, the Turkestan plat containing plants which were killed completely to the ground and others which were partially killed, and the American alfalfa plat some individuals that escaped injury entirely.

The authors point out the desirability of searching the more richly-producing races for individuals of a high specific drought resistance as foundation stock for strains combining this characteristic with succulence and high forage yield. The results of transpiration experiments reported show that of 2 plants 1 transpired about twice as much per square centimeter of leaf surface as the other, thus indicating that it had the lower drought-resisting ability. The results of these experiments are also taken as showing that the relative drought resistance of different pure races of alfalfa plants can be determined to a high degree of probability.

In studying the apparent seeding ability of the plant it was determined that from the number of plants investigated the total number of seeds per plant varied from 1 to 257, the average number of seeds per pod from 1 to 1.64, and the number of seeds per 10 gm. weight of plant from 0.14 to 21.24. Among selected plants close-fertilized for seed production there appeared to exist no constant relation between the number of flowers pollinated and the number of seeds produced. In one instance the stems of the plant were separated as they stood into two portions, on one of which the flowers were hand-pollinated while on the other they were not. The hand-pollinated portion produced 60 per cent more seed than the other, while its productivity per gram weight of green plant amounted to 457 per cent. In another experiment, taking the green weight of the plant as a basis, the insect-pollinated halves of the plants gave 29.7 seeds per each 10 gm. of plant weight, while the hand-pollinated halves produced 25.9 seeds per 10 gm. of plant weight. While there is little difference in seed production here attention is called to the value of the pure lineage and known origin resulting from hand pollination.

Buckwheat crops of the United States, 1866–1906, C. C. Clark (*U. S. Dept. Agr., Bur. Statis. Bul. 61, pp. 24*).—This bulletin presents in tabular form the average acreage, production, and value of buckwheat in the United States by States and by years for the period 1866–1906.

Clover farming on the sandy jack-pine lands of the North, C. B. Smith (*U. S. Dept. Agr., Farmers' Bul. 323, pp. 24, fig. 1*).—This bulletin describes the extent and character of the jack-pine lands of the North, and contains information of value to settlers on these lands.

General farming is not a success on the sandy jack-pine lands, and thus far the crop best adapted to the soil and climate and also most profitable is clover grown for seed. Mammoth clover grows best and gives the largest yield of seed. To succeed with the clover crop it is recommended that the new ground be broken about 4 in. deep in midsummer without burning over, cultivated with the disk harrow, and that the seed be sown 2 in. deep the following spring without a nurse crop, covered with a heavy roller followed by a light spike-tooth harrow. The crop is greatly benefited by light top-dressings of barnyard manure or superphosphates. Marl and land plaster up to 200 lbs. per acre are also beneficial.

Seed corn for the season of 1908, C. G. Williams (*Ohio Sta. Circ. 74,*[a] *pp. 6*).—This circular outlines a method of making germination tests of corn, and calls attention to other points in the spring selection of seed corn. A blank for making the report of the germination test is included.

Cooperative corn work for 1908, C. G. Williams and L. H. Goddard (*Ohio Sta. Circ. 76, pp. 4*).—The plans for cooperative corn work for the season of 1908 are briefly outlined, and attention is called to the different points to be considered.

[Experiments with cotton], R. Ward (*Separate from Off. Gaz. [British Guiana], 1907, Jan. 16, pp. 4*).—The work here reported was carried on in Demerara. The results obtained led to the conclusion that introduced Sea Island, Egyptian, and Upland cotton are failures on stiff clay soil on the coast lands. The growing of the vigorous perennial native kinds—Buck, Sea Island, Brazilian, and Black Peruvian—was found unprofitable. These varieties do not produce a crop until 18 months after planting and only once a year afterwards, and the fiber does not command high prices

It is believed that the hope of the cotton industry lies in artificial hybridization and seed selection from the very best varieties grown. For the purpose of hybridization introduced Sea Island, Buck, Black Peruvian, and Caravonica are recommended for cultivation.

The wild and cultivated cotton plants of the world, G. Watt (*New York and London, 1907, pp. 406, pls. 53*).—This book contains a revision of the genus Gossypium, intended to aid planters and investigators interested in the systematic improvement of the cotton staple. A chapter each is devoted to the history of cotton and the cotton industry, the cotton fiber, the species, varieties, and races of cotton, and the improvement of the cotton plant. An appendix gives an enumeration of specimens examined, a list of works consulted, and synonyms of species and varieties.

Shrinkage of hay in the stack, F. W. Wilson (*Arizona Sta. Rpt. 1907, pp. 224, 225*).—In 1906, 25,530 lbs. of new-mown hay cut on 5 different dates from April 19 to November 9 remained in the stack until February 11, 1907, when the loss due to shrinkage amounted to 2,825 lbs., or 11 per cent. The following season the third crop of hay, amounting to 23 tons, 1,796 lbs., was stacked about July 20. By December 14 a shrinkage of 5 tons, 971 lbs., or 23 per cent, had taken place.

Milo as a dry-land grain crop, C. R. Ball and A. H. Leidigh (*U. S. Dept. Agr., Farmers' Bul. 322, pp. 23, figs. 9*).—This bulletin describes milo, states where the crop should be grown, gives complete directions for growing it, and considers its different uses. "Milo" is recommended as a short and suitable name in place of "milo maize," the latter term often causing it to be confused with corn.

It is pointed out that milo is widely grown in western Texas, is well suited to the Plains region below 4,500 ft. elevation, and that it can probably be profitably grown as far north as South Dakota and westward in Colorado, New Mexico, and the Great Basin region. The soil requirements are much the same as those for corn. The seed should be sown at from 4 to 6 lbs. per acre about 3 weeks later than corn is planted. Four pounds of seed to the acre has given the best results in the Texas Panhandle. The rows should be about 3½ ft. apart and the stalks 6 to 8 in. apart in the row. The yields vary from 25 to 55 bu. of seed to the acre, the average in the Texas Panhandle being about 40 bu.

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[a] The circular on Cooperative Forestry Work for 1908, previously noted as Circular 74 (E. S. R., 19, p. 654) has been relisted by the station as Circular 75.

Fertilizer experiments with calcium nitrate for potatoes, A. STUTZER (*Mitt. Deut. Landw. Gesell., 23 (1908), No. 4, pp. 19–21*).—These experiments were conducted in 1907 on the experiment field of the agricultural institute at Königsberg. Sodium nitrate and calcium nitrate were applied in quantities furnishing 250, 500, and 750 gm. of nitrogen per plat of 100 sq. meters, or 1 are.

In either form equal quantities of nitrogen produced equal increases in yield. The quantity of dry matter obtained per are was a little greater where the medium and heavy applications of calcium nitrate were made than where like quantities of sodium nitrate were used. The best yield of pure starch was secured where sodium nitrate was given in quantities furnishing 500 gm. of nitrogen per are, followed by 250 gm. of nitrogen in the form of calcium nitrate. Larger quantities of calcium nitrate reduced the starch yield.

Fertilizers for potatoes, W. P. BROOKS (*Massachusetts Sta. Circ. 14, pp. 4*).—Brief notes are given on the use of commercial fertilizers for potatoes, as indicated by the results of experiments on soils retentive in character.

Potato crops of the United States, 1866–1906, C. C. CLARK (*U. S. Dept. Agr., Bur. Statis. Bul. 62, pp. 37*).—This bulletin presents in tables the acreage, production, and value of potatoes in the United States by States and by years from 1866 to 1906, inclusive.

Rye crops of the United States, 1866–1906, C. C. CLARK (*U. S. Dept. Agr., Bur. Statis. Bul. 60, pp. 35*).—Tables are given in this bulletin showing the average acreage, production, and value of rye in the United States by States and by years for the period 1866–1906.

Sorghum for silage and forage, J. M. SCOTT (*Florida Sta. Bul. 92, pp. 35–42, pl. 1*).—General directions for the culture of sorghum for silage and forage are given, and yields in a sorghum variety test in 1907 are tabulated. The highest yields of green forage, in the order mentioned, were produced by Pendant Gooseneck, Erect Gooseneck, Planter Friend No. 37, Collier, Orange, and Planter Friend No. 36. The heaviest yields of grain in the head were secured from the following varieties: Shallu 2,112.5 lbs., Red Amber 1,500 lbs., Orange 1,366.5 lbs., and Red Kafir 1,187.5 lbs. per acre.

The isolation of mother beets, G. FRÖLICH (*Bl. Zuckerrübenbau, 15 (1908), No. 1, pp. 1–5*).—In the experiments reported it was observed that beets grown at ordinary distances and allowed to mature without any control produced much larger quantities of seed than beets isolated artificially or grown by themselves.

Fertilizers for sugar beets, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 68–69*).—The results of cooperative fertilizer tests showed that an application of 300 lbs. of superphosphate, 100 lbs. of sulphate of potash, and 75 lbs. of nitrate of soda per acre was not always profitable in growing sugar beets. All the experimenters report quicker germination and earlier thinning by about 3 days as the result of using the fertilizers.

Reports of the progress and improvement in the culture of sugar beets and sugar-beet seed, H. BRIEM (*Bl. Zuckerrübenbau, 15 (1908), No. 3, pp. 43–50*).—A list of 203 articles and publications on the sugar beet and subjects relating thereto published in 1907.

Russia's wheat trade, I. M. RUBINOW (*U. S. Dept. Agr., Bur. Statis. Bul. 65, pp. 77, pl. 1, map 1*).—In continuation of previous work (E. S. R., 18, p. [illegible]), dealing with the conditions under which Russian wheat is produced, this bulletin discusses the conditions under which the wheat of Russia is sent to market and especially to foreign markets. The principal subjects treated are the grain trade organization, transportation of wheat on railways, waterways and the sea, and the currents of the wheat trade. Under grain trade organization the author discusses the influence of the export business, the system of marketing, state and railway credit on grain, impurities in cereals, elevators, grain exchanges, and export trade conditions. Under currents of the wheat trade the topics of distribution, export routes, main wheat railways, average haul on railways and rivers, Siberian wheat movements, and exports by frontiers and principal ports are discussed.

Russian wheat and wheat flour in European markets, I. M. RUBINOW (*U. S. Dept. Agr., Bur. Statis. Bul. 66, pp. 99, dgms. 11*).—In continuation of previous work (see above) this bulletin discusses the domestic conditions of the Russian wheat industry, the principal European markets, the prices of wheat, wheat flour exports, and the conditions of flour production. The statistical information contained in this bulletin has reference mostly to the position of Russian wheat and flour in the world market at large, as well as in the main European and a few eastern markets.

It is pointed out that cereals cover 90 per cent of the cultivated area of the country and that while rye is the main cereal crop grown the wheat area has been steadily increasing since 1861 at the expense of rye and other cereal crops. At the present rate of increase in the wheat area, wheat may become the main Russian crop in another 5 or 10 years. In 1895 the Russian wheat area exceeded 62,000,000 acres and in 1894 its total crop exceeded the American crop. The average yield per acre for the entire country is exceedingly low, probably the lowest in the world, the chief reasons given for this condition being the ignorance and extreme poverty of the Russian peasantry, inadequate methods of agriculture, neglect of scientific rotation of crops, inadequate use of agricultural machinery, lack of fertilizers, and the system of petty land ownership.

Poor facilities for the movement of the wheat crop such as the bad condition of country roads, insufficiency of railway mileage, inadequate equipment of railways in rolling stock, and high freight rates constitute a great disadvantage. Owing to the absence of an elevator system, trading by sample still prevails and the deterioration of the quality and purity of the grain has made this method of trading less and less reliable. These conditions have made Russian wheat less popular than the American grain in the European markets. Russian wheat has, to some extent, been crowded out of such free markets as Great Britain, Belgium, the Netherlands, and the Scandinavian countries, while, on the other hand, highly protected markets as those of Italy, France, Spain, and Germany show a special predilection for the Russian article. From his study of the wheat flour exports, the author concludes that in the immediate future Russia will not appear as an important competitor of this country in European flour markets.

The use of the fanning mill for selecting seed wheat and seed oats, E. G. MONTGOMERY (*Nebraska Sta. Bul. 104, pp. 20–34*).—Experiments were conducted for 8 years with heavy seed wheat separated by the fanning mill, with light seed wheat, and with ordinary unseparated seed of Turkish Red and Big Frame wheat. The results showed no average difference in yield or quality of the crop resulting from the use of heavy or light seed. Similar results were secured for 8 years with Kherson oats. It is believed that where seed wheat or oats have been reasonably cleaned in the thrashing machine no increased yield is to be expected by separating the light and heavy grain by means of the fanning mill. The value in passing such grain through the fanning mill lies in the removal of obnoxious weed seeds.

An improved method of separating buckhorn from red clover and alfalfa seeds, H. B. Shaw (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 2, pp. 12, figs. 10*).—Different methods of removing buckhorn from clover and alfalfa seeds are described. In all of them advantage is taken of the mucilaginous character of the buckhorn seeds. The seed infested with buckhorn is moistened and mixed with sawdust, sand, road dust, or the light, absorbent chaff of various grasses. The buckhorn seeds under these conditions become coated with these different substances and may then be separated by means of the proper screens.

Troublesome weeds of the year, S. B. McCready (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 42–47, figs. 4*).—The following weeds are reported as the most troublesome in the province during the year: *Sonchus arvensis, Silene inflata, Brassica sinapistrum, Agropyron repens, Convolvulus arvensis*, and *Thlaspi arvense*. New weeds becoming troublesome are *Lepidium campestre, Barbarea vulgaris, Antennaria neodioica, Festuca tenuifolia, Euphorbia helioscopia*, and *Saponaria vacaria*. *Eruca sativa, Senecio jacobæa*, and *Chenopodium vulvaria* appeared in Ontario for the first time this season. The number of weed seeds found in samples of 20 gm. each of screenings obtained in the western provinces are given in a table.

Practical farming, W. F. Massey (*New York, 1907, pp. VI+323*).—This book contains 22 chapters, of which 10 treat of the soil, the plant, manure, tillage, and rotation, 10 of crops and cropping, including the culture of corn, wheat, oats, cotton, tobacco, potatoes, hay, and grass, and 2 are devoted to commercial fertilizers for various crops and to useful tables for reference.

HORTICULTURE.

[Report of] the professor of horticulture, H. L. Hutt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 137–148*).—A general outline of the results to date in the growing of orchard fruits and vegetables. The results secured with small fruits were similar to those of previous years (E. S. R., 19, p. 35).

In the plant breeding work the crossing of strawberries and raspberries was largely discontinued and improvement by selection begun. A large number of reciprocal crosses were made between European and American varieties of plums and four suspect fruits were obtained on Glass Seedling and Shipper Pride, both varieties of *Prunus domestica*. No fruits were secured on varieties of *P. americana*. A number of crosses were made in apples and small quantities of seed secured. *P. virginiana*, the common wild chokecherry, was successfully crossed with sour cultivated cherry and the cultivated plums.

Relative to orchard cover crops, it is stated that hardy cover crops are desirable on cold wet soils of that region, in order that they may take up the surplus of soil water in the spring. The cover crops giving the best results after 5 years' tests are hairy vetch, alfalfa, mammoth clover, red clover, and winter rye.

Of the apples, pears, plums, and cherries set out in 1897 all of the fruits, with the exception of apples, have practically succumbed either to the severity of the winters, unfavorable soil conditions, or diseases. A fair proportion of the original 85 varieties of apples have made average growth. Tabular data are given showing the heaviest yielding varieties to date in the young orchard, and the average yield of varieties in the old orchard for the last 5 years.

An investigation was conducted in 1905 and 1906 by G. E. Sanders relative to the sterility and partial fertilization of apple blossoms. Extracts from a table based on this investigation are given showing the relative blooming periods and results of tests of self-sterility among the leading commercial varieties of apples. Sterility tests were also conducted in 1907 with many varieties of pears, cherries, and plums. All the plums tested were found to be self-sterile. Flemish Beauty pear and Dyehouse cherry were strongly self-fertile.

Results of variety and cultural tests with vegetables grown both in the open and under glass are given.

Mushroom and truffle culture, H. L. A. Blanchon (*Culture des Champignons et de la Truffe. Paris, 1906, pp. 163*).—In this work practical directions are given for the growing of mushroom spawn and the culture of the various species of mushrooms in caves, quarries, and in the open air, together with culinary recipes and the methods of conserving mushrooms. The various phases of truffle culture are also considered, including the methods of propagation, planting, cultivation, harvesting, and reconstruction of truffle plantations, together with notes on yields and returns, culinary recipes, and methods of conservation.

Statics of fruit culture, Steglich (*Arb. Deut. Landw. Gesell., 1907, No. 132, pp. 147, figs. 2*).—The author presents a large amount of tabular data relative to long-continued observations and investigations conducted under the direction of the German Agricultural Society, the National Horticultural Society of Saxony, and various pomologists and practical orchardmen, dealing with tree weights, measurements, yields, etc., of several varieties of the more important fruits, including the apple, pear, cherry, and plum, grown on a variety of soils.

The data show the weight relations of the roots, trunk, branches, and leaves to the diameter and length of the main trunk, the annual growth increment of the trunks, the annual increase in wood, the annual leaf and fruit production and their relation to the trunk circumference, and chemical analyses of the vegetative organs and fruit of the trees.

From these data the author has derived a system for estimating the manurial requirements of individual fruit trees, in which the trunk circumference is used as the determining factor. A table is given showing for the apple, pear, cherry, and plum their estimated content in the wood, leaf, and fruits of green and dry substance, nitrogen, phosphoric acid, potash, and lime for each centimeter of trunk circumference from 15 cm. up to 100 cm. with the plum and up to 150 cm. with the other fruits mentioned. The application of the data given is explained and tables are also given to be used in preparing various combinations of fertilizers. It is recommended that the amount of plant food applied to an individual tree range from two to four times the computed amount of plant food removed from the soil by that tree, depending upon the nature of the soil as to its fertility, texture, etc.

Orchard notes, 1907, W. M. Munson (*Maine Sta. Bul. 155, pp. 125–156, dgms. 4*).—This bulletin contains a general summary of investigations conducted by the station in the Kennebec County orchards for several years past relative to the comparison of culture and mulching as a practical treatment for young orchards, fertilizer experiments, and work in orchard renovation and top-grafting (E. S. R., 18, p. 1129). Some data are also given on a comparative test of the Fisher and station fertilizer formulas and on the orchard work at New Gloucester, together with notes on the behavior and present condition of the apples in the station orchards at Orono.

The general conclusion reached relative to the work in the Kennebec County orchards, and previously published, were further confirmed in 1907. The severe winter of 1906–7, however, destroyed many of the trees, and owing to this occurrence, together with the withdrawal of the author from the station, most of the work was brought to a close. Tabular data are given showing the annual growth of trees and yield of fruit in the cultivated and mulched areas for the years 1902 to 1906, inclusive, together with notes on the condition of trees in the spring of 1907.

Observations concerning the effects of different salts of potash upon the growth and behavior of apple trees were continued. In behavior of tree and in gross character of fruit, however, no specific effect of any particular potash salt could be observed.

Satisfactory progress has been made in orchard renovation. Data are given showing the yields secured in this orchard for the years 1903 to 1907, inclusive, as well as the average annual yields of fertilized and unfertilized trees for the same period. Practically every tree in the top-grafted orchard was either killed or badly injured during the winter of 1906–7, hence the work was abandoned without the possibility of drawing conclusions.

A comparison has been made for the past 4 years between the Fisher fertilizer formula, which calls for about 8.6 per cent nitrogen, 3.3 per cent phosphoric acid, and 11.9 per cent potash, and the station formula, which analyzes about 3 per cent nitrogen, 8 per cent potash, and 6 per cent phosphoric acid (E. S. R., 17, p. 973). The annual yields secured under both treatments are given in detail, and the tentative conclusions are reached that on most soils the Fisher fertilizer is unnecessarily expensive, resulting in a waste of available nitrogen, the percentage of which is too high for the best results with fruit, and that it produces fruit which is large but of poor color and coarse texture. The station fertilizer or some similar mixture, together with a supply of humus in the form of cover crops or as a mulch, is believed to be most satisfactory for general orchard use for a term of years.

For the purpose of investigating the question of spray injuries and certain points in field practice, a series of experiments to extend over a period of 5 years was inaugurated in the spring of 1907 at Farmington Falls. The work for the first season was successful from a practical point of view in checking scab, which was abundant on unsprayed trees in the vicinity.

The work at New Gloucester is not sufficiently developed to warrant conclusions. The results, as indicated by the annual yields of 1906–7, are given of a duplicate test being made of the Fisher and station formulas at this place.

The bulletin concludes with a brief discussion by C. D. Woods of the present status of pomology at the Maine Station.

A thousand dollars an acre from pedigree fruit trees, G. T. Powell (*Country Life Amer., 13 (1908), No. 5, pp. 504–506, 538, 540, figs. 12*).—In this popular article the author reports further progress in the improvement of fruit trees by bud selection and in the use of the Northern Spy as a stock for the King apple (E. S. R., 14, p. 253).

Through bud selections he has obtained Duchess apple trees which when set 3 years bore all the apples they could safely carry, a 10-acre Sutton Beauty orchard with remarkably stout branches, and a King apple orchard grown on Northern Spy stocks, the trees of which are particularly exempt from crown disease or canker, shapely though they have never been pruned, and bearing each year fruit of large size, high color, and superior quality.

The varieties recommended for improvement by top-working on strong stocks, represented by the Spy, Northwestern Greening, and Taliman Sweet trees are King, Esopus Spitzenburg, Jonathan, Grimes Golden, Wagener, Lady, McIntosh, Canada Red, and Newtown Pippin.

Successful orcharding in Northwest, E. L. Stewart (*Amer. Agr., 81 (1908), No. 4, p. 89, fig. 1*).—In 1895 the author planted 6 acres of land in the Yakima Valley of Washington to Spitzenburgs and Red Cheek Pippins. A brief account is given of the methods of culture employed, together with a tabulated statement of annual yields and returns obtained from this orchard from 1898 to 1906, inclusive, and a description of the methods of packing and grading. The yields increased from 60 boxes, valued at $54, in 1898, to 5,625 boxes, worth $5,991, in 1906, or a net return of over $725 per acre. The total number of boxes for the whole period was 14,323, yielding a net return of $12,092.

Starting young orchards, W. M. Munson (*West Virginia Sta. Bul. 116, pp. 211–248, pls. 7*).—This contains a brief popular discussion of orchard cultivation, mulching, cropping, and cover crops. Suggestions are also given relative to the use of various cover crops, and methods of pruning and spraying.

In an appended paper, Enemies of Young Fruit Trees, by W. E. Rumsey and F. E. Brooks, the insects and mammals injurious to young fruit trees are discussed and suggestions given for their control. A brief paper by H. Atwood, Poultry in the Orchard, deals with poultry management in connection with orchard culture.

Cold storage fruit notes, 1907, A. D. Cairns (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 12, pp. 902–906*).—Data are given relative to the keeping qualities of several varieties of apricots, peaches, plums, nectarines, apples, and pears stored in the government refrigerating works during the season of 1907.

The respiration of apples and its relation to their keeping, F. W. Morse (*New Hampshire Sta. Bul. 135, pp. 85–92, figs. 2*).—The author conducted experiments for two seasons with the view of determining the rapidity with which apples change in composition when stored at different temperatures, the rate being measured by determining the amount of carbon dioxid given off by the fruit at different temperatures. A simple apparatus, which is illustrated and described, was used for the purpose of collecting and measuring the carbon dioxid. About 2 kg. of perfectly sound Baldwin apples were used in each experiment, and the temperatures maintained, 32° F., 40 to 50°, and 68 to 80°, approximated cold storage, cool cellar, and summer conditions, respectively. The length of time during which the carbon dioxid was collected ranged from 5 to 48 hours of continuous circulation. During the first season measurements were made at different periods from October to March, inclusive, and during the second at different dates during March.

The results for the first season as recalculated for 1 kg. of fruit and 1 hour of time show the average rate of exhalation of carbon dioxid to be 18 mg. at summer temperature, 8.1 mg. at cellar temperature, and 2.7 mg. at the cold storage temperature. The results of the second season's work show the average rate to be 13.2 mg. at 50°, 5.2 mg. at 32°, and 21.9 mg. at 68°.

Since the rate of exhalation of carbon dioxid is an indication of the rate of chemical change within the fruit, it is deduced that changes of composition must take place from 4 to 6 times as fast at summer temperatures as in cold storage, and from 2 to 3 times as fast in cool cellars as in cold storage. Fancy apples intended for long keeping in cold storage should, therefore, be cooled as soon as possible and kept cold.

The effect of temperature on the respiration of apples, F. W. Morse (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 876–881*).—A more technical account of the investigations noted above.

Peach culture in the Mediterranean region, J. Foussat (*Prog. Agr. et Vit. (Ed. l'Est), 29 (1908), No. 3, pp. 81–86, figs. 3*).—A brief account is given of the cultivation of peaches in conjunction with grapes in the southern part of France, including methods of planting, varieties, harvesting, yields and returns, grading, packing, and marketing.

Pineapples, P. Hubert (*Ananas. Paris, 1908, pp. IX+192, figs. 52*).—This is the third of a series of popular treatises on the cultivated crops of Colon, and deals with the botany, varieties, habitat, and geographical distribution of pineapples, and the various phases of their culture under shed and in the open for the fruit and fiber, together with the production of pineapple conserves, drinks, and fiber, with descriptions of the machinery used in the manufacture of the various products. An account is also given of the commercial importance of the industry, with special reference to the French colonies.

The future of the coffee tree in Madagascar and Réunion, J. Buis (*L'Hemileia et L'Avenir du Caféier a Madagascar et a la Réunion. Paris, 1907, pp. 25–44, fig. 1*).—A study of the coffee industry in Madagascar and Réunion, including data relative to climatic and soil conditions, destructive insects and diseases, and the adaptability of the different varieties of coffee to the various agricultural regions. Suggestions are also given for the establishment and care of coffee plantations.

Strawberries, C. P. Close, W. R. Ballard, and T. H. White (*Maryland Sta. Bul. 124, pp. 161–195*).—The results are given of strawberry investigations conducted at the station for the past few years.

In a mulching experiment one plat was covered with straw in early winter, another mulched with strawy horse manure 10 tons per acre at the same time, a third plat given commercial fertilizer but no mulch, and a fourth reserved as a check. The results of the experiment for the 5 seasons, 1902 to 1906, show a gain in yield of the straw mulch over the check of 2,528 qt., and a gain over the check of 1,889 qt. for the strawy manure mulch. The commercial fertilizer was applied for 4 seasons and resulted in a total loss in yield of 2,408 qt. as compared with a check. From these results, straw mulch applied in early winter is strongly recommended.

The results of the mulching work in 1907 are also given, and indicate that it is most profitable to follow the practice of late cultivation and mulching. The plat cultivated and tilled late in the fall and mulched with strawy fresh horse manure in early winter yielded at the rate of 6,294 qt. per acre, as compared with 3,289 qt. per acre yielded by the check which received late cultivation but no mulch. The poorest yield per acre, 2,581 qt., was secured where cultivation ceased early and the crab grass was allowed to grow.

Tabular data are reported showing the yield in quarts per acre of varieties of strawberries tested at the station during 1905, 1906, and 1907. Full horticultural descriptions of the varieties grown in the testing plats are also given, together with practical suggestions on strawberry culture.

Monograph of the vineyards at Ampuis (Rhône), C. Roux (*Ann. Soc. Agr. Sci. et Indus. Lyon, 1906, pp. 341–443*).—In this work the author traces the evolution of the wine industry in the district of Côte-Rôtie near Ampuis. Successive chapters deal with the history of Ampuis and its vineyards, topography, geology, ampelography, and wine making. In a series of appendixes a bibliography is given of sixty of the principal reports and works consulted, notes on the ancient terms of measurements used by the Lyonnaise wine growers, comparative data on the principal vineyards in the Valley of the Rhône, and a resumé of the viticultural and wine making statistics of the department of Rhône.

Report of the nursery of American vines started by the royal school of viticulture and wine-making in Conegliano, M. Giunti and F. A. Sannino (*Rivista, 4. ser., 14 (1908), No. 1, pp. 2–16, figs. 8*).—A general description of the stock and propagating nurseries started in 1900 by the royal school of viticulture and wine-making at Conegliano, including an account of planting operations, and a description of the methods employed at the school in propagating root-grafts.

Data are also given showing the percentage of attachment of grafts made between the principal European vines and various American stocks during 1903 to 1906, inclusive.

The influence of the stock on the product of the graft, F. PAULSEN (*Bol. Uffic. Min. Agr. Indus. e Com.* [*Rome*], *6* (*1907*), *VI, No. 7–8, pp. 865–878*).—With a view of ascertaining what influence, if any, is exerted by various American grapes used as stocks on which native Sicilian vines are grafted, the author sent out inquiries to 200 viticulturists. A summarized account is given of the information secured, together with tabulated analyses of wine produced from vines grafted on various American stocks.

The author comes to the general conclusion that American stocks have with few exceptions increased the production without essentially deteriorating the quality, and that in some cases the quality has been improved. Although no definite conclusion is reached as to the exact method by which the stock improves the product, it was found that not all of the European varieties were affected in the same manner. The favorable influence appeared to be more marked on calcareous soils. The varieties recommended as being adapted for Sicilian soils, and to have good affinity for the grafts, are Berlandieri and its hybrids, especially Riparia×Berlandieri, Aramon×Rupestris Ganzin and R. du Lot, and Riparia Gloire and Grand Glabre.

Nut growing in Maryland, C. P. CLOSE (*Maryland Sta. Bul. 125, pp. 196–217, figs. 14*).—This bulletin contains a report on a nut survey of the State made by the station in 1907, together with directions for propagating and planting Persian walnuts and pecans, and for top-grafting or budding black walnut trees and unfruitful or inferior Persian walnut trees to improved varieties of the Persian walnut. Descriptions are given of desirable varieties of Persian walnuts and pecans.

As a result of the nut survey the author is of the opinion that the Persian walnut can be profitably grown in Maryland under proper treatment. It is also believed that the most hardy varieties of pecans will also succeed, although but a few named varieties of the improved sorts have thus far been tried.

Some problems in experimental horticulture, W. M. MUNSON (*Proc. Soc. Prom. Agr. Sci., 28* (*1907*), *pp. 122–128*).—In this paper the author presents for discussion a few problems dealing with plant breeding and acclimatization, which it is believed should be accorded more attention at the stations.

FORESTRY.

The forestal formation of woodlands, H. REUSS (*Die Forstliche Bestandesgründung. Berlin, 1907, pp. XIV+398, figs. 64*).—This work is said to be based on modern principles, and is intended as a text-book and manual for instruction and practice in the development of woodlands. Part 1 deals with woodland development by means of seeds, including natural regeneration and artificial development by means of seed and plants, part 2 treats of regeneration by means of sprouts, and part 3 contains specific instructions for the use of all the important wood species in the development of woodlands. In an appendix an extensive list, with cross references, is given of the authorities and practical foresters quoted, together with a bibliography of the more recent forest literature dealing with the various phases of woodland development.

Some fundamental principles of sylviculture as stated by Prof. Heinrich Mayr, R. ZON and A. T. BOISEN (*Forestry Quart., 5* (*1907*), *No. 2, pp. 174–189*).—This statement of principles, which originally appeared in *Allgemeine Forst- und Jagd-Zeitung* for 1901, is said to represent the accumulated experience and the crystallized net achievement of many years' observation of tree growth under the most varied conditions of soil and climate, and is here translated with the view of making it available to American foresters.

History of the lumber industry of America, J. E. Defebaugh (*Chicago, 1907, vol. 2, pp. XIII+655, pls. 16, dgm. 1, map 1*).—Volume 1 of this work (E. S. R., 17, p. 1073) contains a large amount of general information relative to the history of the lumber industry in North America, together with a detailed account of the industry in eastern Canada.

The present volume is devoted principally to the history of the white pine industry in the United States, in which the lumbering operations are traced beginning with the State of Maine, through the New England States, and across New York and Pennsylvania. Attention is also given to other species which have been lumbered with white pine in the order of their occurrence in the different regions.

The sprout forests of the Housatonic Valley of Connecticut, G. F. Schwarz (*Forestry Quart., 5 (1907), No. 2, pp. 121–153, pls. 3, figs. 7, dgms. 4*).—A sylvicultural study of the sprout forests of the Housatonic Valley, undertaken for and published with the permission of the Forest Service of this Department. Three distinct types of growth were found to occur, this being due to differences in soil conditions and the relative position on the slopes.

Tabulated data for the three forest types are given and discussed relative to the average number of trees per acre, diameter and average age of trees, the capacity for sprout production, the effects of light and shade in the development of sprouts in the different species, and the amount and character of reproduction and estimated yield of sample areas, together with diagrams showing the rates of height, diameter, and volume growth.

Forest planting on the northern prairies, J. M. Fetherolf (*U. S. Dept. Agr., Forest Serv. Circ. 145, pp. 28*).—Results of a study of the existing plantations in the northern prairies, conducted by the Forest Service with the view of determining the species best adapted for planting in that region, are presented.

Brief notes are given on the location, topography, soil, climate, and early plantings in the northern prairies. Tree planting is considered both for protective and for commercial purposes, and a list is given of trees recommended for planting, together with a detailed discussion of the merits of each species based upon general observations as well as upon actual measurements of a number of planted groves. The details of planting are also considered, including planting material, source of plants, preparation of soil, mixing species, spacing, cultivation, pruning, thinning, and regenerating groves.

California red fir in the Tahoe forest reserve, M. B. Pratt (*Forestry Quart., 5 (1907), No. 2, pp. 159–165*).—Observations on this species as it occurs in the Tahoe forest reserve, including its botanical characteristics, habitat, associated species, reproduction, diseases and enemies, commercial value, and considerations in marking for cutting with a view of affording protection against wind-throw, retarding snowslides on steep slopes, insuring abundant seeding, and leaving a nucleus for future crops.

The maritime pine or Pinus maritima, F. Albert (*El Pino Maritimo o Pinus Maritima. Santiago de Chile: Govt., 1907, pp. 58, figs. 30*).—A monograph on this species of pine, which the author recommends for planting in certain coastal regions of Chile. The work includes a list of common names, botanical synonyms, and a botanical description of the species, together with an account of its range and geographical distribution, varieties, the timber and its uses, the methods of extracting resin in various countries, methods of propagation, sylvicultural treatment, exploitation, etc., with special reference to Chile.

Philippine woods, F. W. Foxworthy (*Philippine Jour. Sci., 2 (1907), No. 5, pp. 351–404, figs. 55*).—This paper contains a general and technical discussion of woods, including wood structure, gross morphology, minute anatomy, physical and chemical properties, and durability and decay, with special reference to Philippine species, together with a key to the common commercial woods of the Philippines and notes on the structure, appearance, common names, range, and usefulness of individual species.

The Japanese forests and their exploitation, J. Harmand (*Rev. Sci.* [*Paris*], *5. ser., 8* (*1907*), *Nos. 11, pp. 321–326; 12, pp. 365–369*).—A general account of the range and constitution of Japanese forests, methods of exploitation, and the present condition of forestry in Japan, as well as of the forest administration in the period previous to the restoration of the Empire, the present administration, forestry laws, and schools. The more important species of trees in the Japanese forests are described and a short bibliography is also given.

The total forest area of Japan, including that owned by the State, the Imperial House, communities, and private individuals, is said to be about 50,000,000 acres, inclusive of barren and denuded lands. According to the last statistics 21 per cent of the stands are coniferous forests, 25 per cent hardwoods, 45 per cent mixed, and 9 per cent cleared or barren lands.

The Carolina poplar, C. E. Bessey (*Ann. Rpt. Nebr. Bd. Agr. 1906–7, pp. 203–210*).—A preliminary report of an inquiry made at the request of the Forest Service of this Department relative to the identity and characteristics of a tree which is being largely sold in the West under the name of Carolina poplar.

The tree has been known in this country for nearly 100 years as *Populus angulata.* Numerous authorities are cited to show that it is distinct from western cottonwood (*P. occidentalis*), though it is not yet clear that it is distinct from the eastern cottonwood (*P. deltoides*). The Carolina poplar requires a good deal of moisture and will not thrive on a dry soil. It is recommended for planting where shade, protection, and fuel are wanted in the shortest possible time, but for lumber the western cottonwood is to be preferred, since it will produce a larger tree and is apparently longer lived.

Annual report of the superintendent of State forests, W. F. Fox (*N. Y. State Forest, Fish and Game Com. Ann. Rpt., 12* (*1906*), *pp. 39, pls. 20*).—A report of forest operations for the year 1906, dealing with the progress made in planting, the prevention of forest fires and trespasses, the annual timber product of the State preserves, etc., with a detailed account of planting operations and the methods employed in the State nurseries for the propagation of forest tree seedlings. The total amount of nursery stock available for planting in the spring of 1907 was 251,844 trees.

Statistics are also given showing the product of the forests and woodlands in the State of New York for the year 1905, arranged according to species, localities, and industries. The lumber cut was 750,280,465 ft. B. M., the cut of pulp wood 536,580 cords, equivalent to 294,582,420 ft. B. M., and the cut of round wood for cooperage, excelsior, wood alcohol, etc., 167,207,283 ft. B. M. In addition, 53,374,000 shingles and 67,908,300 lath were cut. The principal species of conifers according to their product were spruce, hemlock, pine, and balsam. The cut of hardwoods amounted to 414,791,505 ft. B. M. The estimated forest resources of New York are given as 7,660,000,000 ft. B. M. from coniferous species and 38,400,000,000 ft. B. M. of hardwoods, including the cut from all private woodlands as well as State reserves. The area of the Adirondack preserve at the end of 1906 was 1,415,775 acres, and of the Catskill preserve 104,524 acres.

Administration report of the forest circles in the Bombay Presidency including Sind for the year 1905–6, F. Gleadow et al. (*Admin. Rpt. Forest Dept. Bombay, 1905–6, pp. 176*).—This is the customary annual report of forest operations in the northern, central, southern, and Sind forest circles, including a report on the constitution of State forests, the preparation of working plans, forest survey and fire protection work, sylvicultural operations and exploitation, together with financial statements for the year. The important data are tabulated.

Report of the chief, forestry division, K. A. Carlson (*Dept. Agr. Orange River Colony, Ann. Rpt., 3 (1906–7), pp. 107–151, pls. 4*).—A progress report on forestry operations in the Orange River Colony for the year ending June 30, 1907. In addition to the statements relative to planting operations, advisory work, sale and distribution of trees, and finances, considerable tabulated data are given showing the effect of frost at the end of May, 1907, on a large variety of planted trees.

Annual report upon state forest administration in South Australia for the year ended June 30, 1907, W. Gill and E. J. Field (*Ann. Rpt. State Forest Admin. So. Aust., 1906–7, pp. 12, pls. 5*).—A brief account of the year's planting and other forest operations, with tabulated data showing the areas of forest reserves and plantations, the planting and distribution of trees, further data on date palm culture (E. S. R., 18, p. 839), and a financial statement.

The report is accompanied with a series of plates illustrating specimen trees and forestry operations in South Australia.

The steaming of timber, O. Chanute (*Sci. Amer. Sup., 64 (1907), No. 1664, pp. 323, 324*).—An abstract from an address delivered before the National Association of Wood Preservers, in which the author discusses the advisability of steaming wood for the purpose of cleaning sap cells previous to the injection of preservatives. The usual methods of treatment are reviewed and a summary is given of his results from a large number of experiments along this line.

With half seasoned ties, air-dried from 4 to 6 months, more sap was extracted by 1 to 3 hours steaming than could be extracted from fresh cut ties by 3 to 5 hours steaming at 20 lbs. pressure. With fully seasoned ties, or those seasoned from 6 to 12 months from the cutting, steaming sometimes increased the weight and at others diminished it within a range of 2 per cent either way. When chlorid of zinc was used as a preservative it was found that for fully seasoned ties more could be injected when the steaming was omitted, since a certain percentage of the condensed steam remained in the wood, thus reducing the quantity of solution which could be forced into the tie. The general conclusion is reached that whether or not it is advisable to resort to steaming depends altogether on the condition of the wood at the time it is to be preserved.

As a result of these experiments the practice has been developed at the works of the author of refusing to treat fresh cut ties and to begin the spring season's treating by steaming unless the ties are of the previous year's cutting, when the steaming is omitted. Steaming is also omitted in the summer and autumn when the ties prove to be well seasoned.

Propagation of camphor, J. K. Nock (*Circs. and Agr. Jour. Roy. Bot. Gard. Ceylon, 4 (1907), No. 3, pp. 13–20, figs. 2*).—Brief popular directions are given for the propagation of camphor by seeds, layers, branch and root cuttings, and suckers.

Rubber planting in Mexico and Central America, P. Olsson-Seffer (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 1, pp. 1–31; Bul. Dept. Agr. [Jamaica], 5 (1907), No. 10–11, pp. 191–222*).—This article is published with a view of furnishing information relative to the present condition of the cultivated rubber industry in the above-named countries.

The author uses the name "Castilla" instead of the common term "Castilloa," as the former is said to have the right of priority. Consideration is given to the different forms and the geographical distribution of Castilla rubber and to planting operations in Central America and Mexico, with special attention to the culture, tapping operations, and preparation of Castilla rubber on the La Zacualpa plantation, together with an outline of the experiments which are being conducted at the La Zacualpa Botanical Station and Rubber Laboratory.

An attempt was made to cultivate the Ceara rubber in Mexico in the vicinity of La Zacualpa at an elevation of 2,000 ft. The trees have not developed well, but the amount of latex is reported as satisfactory. Tapping experiments are to be conducted with these trees. A brief account is also given of the production of Guayule rubber in northern Mexico.

Para rubber from the Federated Malay States (*Bul. Imp. Inst., 5 (1907), No. 3, pp. 246–248*).—Tabulated data are given showing the analyses of 16 samples of Para rubber (*Hevea brasiliensis*) forwarded from the Federated Malay States to the Imperial Institute. Eleven of the samples were found to contain over 94 per cent of caoutchouc, the poorest sample analyzing 92.64 per cent. From these results it is believed that a high degree of purity can be obtained in the preparation of Para rubber from cultivated trees in the Federated Malay States.

Rubbers from the Gold Coast (*Bul. Imp. Inst., 5 (1907), No. 3, pp. 248–251*).—Reports on analyses of samples of Ceara (*Manihot glaziovii*), Assam (*Ficus elastica*), "Krepi Ball" (*Landolphia owariensis*), and "Ofruntum" (*Funtumia elastica*) rubber received from the Gold Coast. The Krepi Ball rubber showed the highest content of caoutchouc, analyzing 91.3 per cent, whereas the Ceara rubber analyzed only 67.7 per cent caoutchouc.

DISEASES OF PLANTS.

Notes on certain rusts, with special reference to their peridermial stages, G. P. CLINTON (*Abs. in Science, n. ser., 27 (1908), No. 687 p. 340*).—Notes are given on the æcidial stages of some heterœcious rusts, which are grouped under the form genus Peridermium, but which in their teleutospore stages are recognized as different genera.

A number of these species are enumerated, and during the past year the author made a special study of various stages of such of these rusts as occur in Connecticut. Through field observations, confirmed by inoculation tests, the relationships of two additional species are now known. *Peridermium pyriforme*, which is found on *Pinus sylvestris* and *P. rigida*, is known to be the æcidial stage of *Cronartium comptoniæ*, on *Comptonia asplenifolia*. *Peridermium consimile*, on *Picea nigra*, is in a similar way connected with *Melampsoropsis cassandræ*, on *Cassandra calyculata*. There is some evidence also that *P. peckii*, occurring on *Tsuga canadensis*, is the æcidial stage of *Chrysomyxa albida*, on *Rubus hispidus*, but further proof is needed before this is definitely established.

Notes on a parasitic Gnomonia, C. W. EDGERTON (*Bul. Torrey Bot. Club, 34 (1907), No. 12, pp. 593–597, figs. 3*).—While making a study of anthracnose of blackberry canes, the author reports having found a few canes affected by the fungus *Gnomonia rubi*. A study of the disease showed that the fungus had no connection with the Glœosporium causing the anthracnose. The fungus is apparently unrecorded in this country and it is believed it may occasionally cause a disease of the blackberry canes.

The disease seems to make its appearance in the spring, but no effect is noticed on the canes for sometime. The leaves develop normally, blossoms appear on the stems, and the fruit sets, but after the fruit has become about half grown the leaves and fruit above the spots suddenly wilt and dry up. The effect on the plant seems to be that of girdling.

A study was made of the fungus, but the inoculation experiments carried on were in the main unsuccessful, although 2 plants were infected with the disease. From this it is believed that the fungus is a weak facultative parasite, which grows readily as a saprophyte on dead canes, but which, if the conditions are suitable, will adapt itself to the living plants. It is not thought probable that this fungus will become a serious pest.

Injurious fungus diseases of the year 1907, S. B. McCready (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 48, 49, fig. 1*).—Notes are given on the crown gall, pear leaf scald, Alternaria blight of ginseng, and a blighting of oats which is attributed to unfavorable weather conditions, the root system having been impaired by a continued cold spell following an early warm season. For the different diseases remedies are suggested, so far as any are known.

Notes on plant diseases occurring in North Carolina, F. L. Stevens and J. G. Hall (*North Carolina Sta. Rpt. 1907, pp. 58-71, figs. 7*).—Notes are given on the occurrence and characteristics of a number of diseases which have been observed on plants of economic importance in North Carolina, together with suggestions for their control where definite means are known.

Treatment of grain for smut, C. A. Zavitz (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 179-181*).—For a period of 5 years experiments have been carried on in which seed oats and wheat have been treated with formalin, copper sulphate, potassium sulphid, and hot water for the prevention of smut.

No smut has been observed in the crop for 5 years where the seed was immersed in or sprinkled with dilute formalin or immersed in hot water, and practically none where the seed was soaked in a copper sulphate solution for 12 hours. The other treatments were somewhat less efficient. The average percentage of smutted heads in the untreated oats for the 5 years was 5.7 per cent and for winter wheat 3.5 per cent.

In connection with these studies investigations were conducted on the susceptibility of different varieties of oats to attacks of smut. The results of 4 years' experiments have shown that the variety Early Ripe was almost entirely free from smut, followed by Joanette, Siberian, American Banner, Black Tartarian, and Early Champion, in the order named, the last variety proving quite susceptible to the disease.

On account of the great resistance of the variety Early Ripe, the author has made a number of hybrids between this variety and the variety American Banner, in order to obtain the resistance of the first variety combined with the yielding and other valuable qualities of the second.

Notes on immune wheat, A. and Gabrielle L. C. Howard (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 278-280*).—A brief note is given on experiments made in India to obtain wheats immune or resistant to rusts.

Following up the suggestion of Biffen (E. S. R., 19, p. 44) that einkorn would probably be available for crossing, samples of this wheat were obtained and grown in different parts of India. In no case did einkorn produce any seed, the plants remaining in a vegetative condition throughout the season.

In general the immunity to rust previously reported upon was observed in the Punjab region. At Pusa light green translucent spots were noticed on some of the leaves, and later these developed the black rust of wheat (*Puccinia graminis*). Contrary to the opinion expressed by Butler (E. S. R., 18, p. 842), the authors state that where a suitable host plant is present, this species of rust can pass from one crop to another in the uredo stage.

Although einkorn did not prove of service in the authors' experiments, emmer proved to be immune to rusts, and it is believed that this can be used in breeding resistant wheats in certain parts of India.

Warty disease of potato, A. W. Borthwick (*Notes Roy. Bot. Gard. Edinb., 1907, No. 18, pp. 115–119, pl. 1*).—A description is given of a disease of potatoes, due to the fungus *Chrysophlyctis endobiotica.*

An examination of tubers affected by this fungus showed at times only a few localized warty excrescences, while at other times the whole potato was converted into a coral-like mass. The author claims to have found evidence which indicates that the parasite is able to obtain lodgment on other parts of the plant than the tubers, and possibly it can spread from infected leaves, stems, etc.

The spraying of Irish potatoes, F. L. Stevens (*North Carolina Sta. Rpt. 1907, pp. 27, 28*).—A brief account is given of spraying experiments to determine the relative value of ordinary Bordeaux and soda Bordeaux mixtures, and to learn whether spraying potatoes for fungus diseases will pay in the eastern section of North Carolina as it does elsewhere in the United States.

Five applications were made to the potatoes, and while the season throughout was unfavorable, the sprayed plants were much better in appearance, and a net increase, valued at $21.05 per acre, was obtained where ordinary Bordeaux mixture was used, costing $5 per acre. Soda Bordeaux was much less efficient than Bordeaux mixture made with lime.

Curly top, a disease of the sugar beet, C. O. Townsend (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 122, pp. 37, pls. 11*).—This bulletin gives the results of investigations carried on during the past 6 years and deals with what is probably one of the most destructive diseases of the sugar beet. While the results in the main are negative, yet enough has been learned to offer some suggestions regarding the communication of the disease.

The external characters or symptoms of the curly top are to be found in all parts of the diseased plant. The leaves that develop after the beets become affected with the disease are much smaller and more numerous than the normal leaves, and the petioles are very short. The leaf blades are shorter and narrower than normal and decidedly crinkled. On the underside of the leaf blade are many elevations, giving the surface a rough appearance. The roots of the beet affected with curly top are usually hairy, but this character is somewhat variable. The tissues of the leaves and leaf stems show a great distortion of the cells, and diseased roots show darkened fibrovascular bundles. The roots are more or less fibrous or woody, but there is little decay or softening of the tissue in any part of the plant.

In addition to the above constant symptoms, the beets are sometimes stunted, or appear wilted as though suffering from lack of moisture, or there may be present a dark spot in the interior of the crown, in which a cavity frequently develops.

Curly top is not confined to any variety of beets, and young plants seem most easily attacked. When the outbreak is very serious, frequently more than 50 per cent of the plants are stunted in their growth, probably not attaining more than one-quarter their normal size.

The different reputed causes of curly top have been investigated with negative results, and the author thinks it is not identical with any disease of the beet previously described, except possibly that reported from Indiana (E. S. R., 11, p. 756). Thus far the disease seems to be confined to the middle and western parts of the United States, and occurs in beets under a great variety of soil and climatic conditions. No parasite has been isolated from the diseased plants thus far, and it does not seem to be communicated directly from one plant to another. So far as known, the disease has not appeared to any serious extent

2 years in succession in the same locality, and growers need not hesitate to plant beets in the field, even though the entire crop was destroyed by the curly top disease the previous year. There appear indications that a strain of beets resistant to this disease may be developed.

Red rot of the sugar cane stem, L. LEWTON-BRAIN (*Hawaiian Sugar Planters' Sta., Div. Path. and Physiol. Bul. 8, pp. 46, figs. 15*).—The author gives an account of his investigations on the red rot of sugar cane, due to *Colletotrichum falcatum*. This disease, which was originally described from Java, has since been reported in a number of cane-growing regions, but there seems to be little evidence that it has ever become severely epidemic in Hawaii. It appears, however, that there have been occasional outbreaks and that these have been unnoticed or referred to borers.

The disease is said to have no external symptoms by which it can be immediately recognized, and it is probable that the first indication of its presence will be a noticeable falling off in the sugar content of the cane. A description and illustration are given of the internal characters, the most characteristic of which are white spots surrounded by a well-defined red border. It appears that the disease is limited to the inner sweet tissues of the cane.

The fungus seems to be a wound parasite, and in Hawaii enters the cane usually through wounds made by the cane borer (*Sphenophorus obscurus*). It may also be perpetuated by the planting of diseased cuttings. The loss due to its presence will vary with the susceptibility of the varieties. In some instances it may result in the death of the canes, but in most cases the damage is confined to a reduction in the sucrose content.

A large number of experiments have shown that the fungus readily inverts sucrose, and in culture experiments it will convert practically all the sucrose in a solution into dextrose and levulose. By grinding the mycelium with quartz sand, an enzym was extracted which experiments showed to be capable of the conversion.

The author recommends careful selection of cuttings as a preventive treatment for the red rot, and if this should fail, the planting of certain resistant varieties, among them Yellow Caledonia.

Some tobacco seed-bed troubles, W. T. HORNE (*Cuba Rev., 6 (1908), No. 3, pp. 24, 25*).—An account is given of experiments in sterilizing the soil of seed beds by the use of formalin for the prevention of damping off of tobacco seedlings.

Cabbage resistance to black rot, S. F. EDWARDS (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), p. 134*).—A report is given of experiments in testing the resistance of cabbage to the bacterial black rot, and it is stated that one variety, Houser, grew with great vigor and suffered no appreciable injury from the disease. Potted plants of this variety were inoculated with pure cultures of the black-rot organism, but under the most severe laboratory conditions they suffered but little injury. It is believed that this variety is practically immune to black rot under field conditions.

Sclerotia on carrots, F. L. STEVENS (*North Carolina Sta. Rpt. 1907, pp. 31, 32, fig. 1*).—A diseased condition of carrots is described in which the roots bore small sunken areas, somewhat soft, and usually bearing strands of white cotton-like mycelia. Later the diseased spots enlarged and the whole area was covered with a dense felt of white mycelia. When carrots in the incipient stages of the disease were placed in a moist chamber they developed within 24 hours a luxuriant growth of white mycelia.

The fungus causing this rot is believed to be the same as that described in Florida as occurring on eggplants, tomatoes, and other plants (E. S. R., 5, p. 790).

A bacterial disease of lettuce, F. L. STEVENS (*North Carolina Sta. Rpt. 1907, pp. 29, 30, fig. 1*).—The author states that in 1907 lettuce plants were received in which the leaves were mildly infected with some disease that was characterized by the appearance of pale, yellowish-green spots 1 mm. or less in diameter. Later these spots turned straw colored and then brown, and as the spots enlarged there was considerable shrinking and drying of the diseased tissues.

Upon microscopic examination no fungus was found, but the tissues were swarming with bacteria. Cultures were made of these organisms, and although inoculation experiments did not prove successful, the absence of any other causal agent and the universal appearance of bacteria in practically pure cultures made it seem probable that the disease is due to bacteria. It is thought possible that the disease may be the same as that reported by the Massachusetts Station (E. S. R., 19, p. 245).

Fungus diseases of sweet potatoes (*Agr. News* [*Barbados*], 7 (*1908*). *No. 152, pp. 56, 59*).—Attention is called to the fact that the black rot of sweet potatoes is due to the fungus *Sphæronema fimbriatum*, or *Ceratocystis fimbriata*, as was first reported.

Further attention is called to the fact that the only fungus disease of sweet potatoes in the West Indies that is of grave importance is caused by a basidiomycetous fungus, which is probably a species of Marasmius. The mycelium of this fungus envelops the roots underground and renders them unfit for use.

Notes are given on a number of other diseases of sweet potatoes that occur in different countries but which have not yet been reported from the West Indies.

Some stem tumors or knots on apple and quince trees, G. G. HEDGCOCK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 3, pp. 16, figs. 11*).—A peculiar form of tumors or knots has been observed on apple and quince trees in different parts of the United States for a number of years and has been under observation by the author during the past 5 years.

The tumors occur on the trunks, limbs, and twigs of apple and quince trees. On the apple tree the disease appears most often on the trunk and larger limbs, but in a number of instances affects the twigs and smaller limbs.

The tumors, as described from a specimen from the Arkansas Experiment Station, were exceptionally large at the beginning and frequently appeared in the form of a smooth swelling surrounding the base of a dormant bud, quite often the terminal bud of a twig. The tumors vary in size from that of a small pea to others attaining a diameter of 2 to 3 in. During the first period of their growth the swellings are covered with a thick, fleshy layer of meristem and bark tissues. The growth is often quite rapid for the first year or two, and in about 3 years the bark covering the tumors becomes ruptured and ceases to grow. As the bark falls away, small elevations, which resemble short thickened root caps, appear on the surface of the tumors, giving them a warty appearance. In the older forms in some cases the tumors show a slight decay. On the quince the disease originates quite similarly to that described for the apple tree, with the exception that tumors have not been noted affecting the ends or bases of small twigs.

A number of experiments have been conducted to throw light upon this disease, and scions were taken from the specimen tree mentioned above and grafted on roots from healthy apple seedlings. One hundred of the grafts were planted, and at the end of the season 69 per cent were found to be affected with the woolly-knot form of the hairy-root disease. It appears that the hairy-root disease may have at least 3 forms—the simple, the woolly knot, and the aerial forms, described above.

Nurserymen are advised to be careful in the selection of scions and stocks for propagation and to see that they are always taken from healthy trees.

From the reports that have been received and the author's observations, trees and orchards affected by the aerial form of this disease need not be cut out, as there appears to be no spread of the disease and in many cases the trees bear profitable crops. If, however, the trees are not doing well as compared with healthy trees, they should be removed.

Glœosporium disease of currants, H. T. Güssow (*Gard. Chron., 3. ser., 42 (1907), No. 1080, p. 180, fig. 1*).—A description is given of an injury to black currants which is attributed to attacks of *Glœosporium curvatum.* This fungus had been considered distinct from *G. ribis*, occurring on the gooseberry and red and white currant, but the author thinks from the evidence at hand that they will probably prove identical.

Attention is called to investigations of H. Klebahn (E. S. R., 18, p. 347) in which he showed that *G. ribis* is a form of Pseudopeziza, to which the name *P. ribis* is applied.

For the prevention of the attack of this fungus on currants thorough spraying with Bordeaux mixture is recommended.

The spread of the chestnut disease, W. A. Murrill (*Jour. N. Y. Bot. Gard., 9 (1908), No. 98, pp. 23-30, figs. 5*).—The chestnut disease, previously described (E. S. R., 19, p. 250), is said to have continued its spread about New York City and elsewhere, the pruning of diseased branches having entirely failed to check it, even in the case of very young trees.

Observations on the Japanese chestnut tree as well as on the chinquapin (*Castanea pumila*) show that these species as well as the common chestnut (*C. dentata*) are subject to the attack of this fungus. In the present condition of information regarding this disease, the author does not consider it safe to put out chestnut plantations at any point within the known area of distribution of this fungus. Those made elsewhere should be started from seed and carefully guarded.

The chrysanthemum ray blight, F. L. Stevens (*North Carolina Sta. Rpt. 1907, pp. 33-47, figs. 11*).—A detailed description is presented of a disease of chrysanthemums to which the name ray blight is given. This disease has been known for several years, and a previous account has already been given (E. S. R., 19, p. 658). The symptoms of the disease, the character of the fungus (*Ascochyta chrysanthemi*), its action in cultures, and the results of inoculation experiments are described in detail.

Prepared Bordeaux mixture, C. D. Woods and H. H. Hanson (*Maine Sta. Bul. 154, pp. 119-124, dgm. 1*).—A comparative trial was made of 5 dry preparations and 4 wet forms of Bordeaux mixture, all offered under trade names, with the result that the ready-prepared Bordeaux mixtures proved about as effective as freshly made Bordeaux, provided they were used in such amounts as to supply an equal amount of copper. None of the substitutes for wet Bordeaux mixture approached in any way the efficiency of the wet preparations for preventing the late blight. It is believed that the wet ready-to-use Bordeaux mixtures can not be depended upon to prevent blight unless used in quantities much larger than the directions call for, and that the dry Bordeaux mixtures are not nearly so effective as the wet ones.

Self-boiled lime-sulphur mixture as a promising fungicide, W. M. Scott (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 1, pp. 18, figs. 2*).—On account of the corrosive action of Bordeaux mixture, particularly when used during wet seasons, experiments have been carried on to discover a substitute as a fungicide. The author has experimented with a mixture of sulphur and lime and finds that it is quite efficient for the control of the ordinary leaf and fruit diseases of the apple and peach.

This fungicide, which is not a new one, having been recommended for use many years ago, was made by the author by placing 15 lbs. of fresh lime in a barrel, pouring over it 2 or 3 gal. of boiling water, and immediately adding 10 pounds of sulphur and another bucket of hot water. The mixture will boil vigorously for several minutes and should be stirred and more water added if the mass gets too thick. After the boiling ceases, which should be in from 20 to 30 minutes, the mixture should be diluted with cold water to make about 50 gal., thoroughly stirred, and strained to take out the coarse particles of lime.

This fungicide has been tested in connection with apple bitter rot experiments, apple blotch, apple scab, and leaf spot and found but little inferior to Bordeaux mixture, and so far without any injurious effect. As a fungicide for the control of peach brown rot and scab it has proved exceptionally favorable, as the amount of disease is greatly reduced, and the corrosive effect of the Bordeaux mixture, resulting in a defoliation of the tree, is avoided.

The self-boiled lime-sulphur mixture is said to have some effect as an insecticide against scale insects, but is not so efficient as the boiled mixture usually recommended. It can, however, be applied without injury to the trees during any season of the year.

The investigations reported are considered only preliminary and are the basis for further experiments.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The destruction of rats, E. Bonjean (*Quinz. Colon., 11 (1907), No. 22, pp. 1007-1011*).—In destroying rats in rooms and closed buildings it appears to be wise to generate the gas simultaneously from above and below in order to drive the rats from their hiding places if possible and expose them to its influence. Good results may be obtained by burning 35 gm. of sulphur per cubic meter of space or volatilizing 70 gm. of sulphurous anhydrid. The fumigation should be maintained for a period of 2 hours.

Field mice as carriers of warble flies, G. Korff (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 5 (1907), No. 12, pp. 138-140, fig. 1*).—In capturing mice on a large scale for use in a laboratory in the preparation of virus for the destruction of field mice it was observed that a number of them were infested with a warble fly which the author believes to be *Hypoderma bovis*. The larvæ of this insect were found underneath the skin in the same situation in which they occur in cattle. The infested mice came from pastures used for cattle grazing. The author suggests that this discovery constitutes another reason for a general campaign of mouse destruction.

Rodents injurious to rubber plants, J. Vosseler (*Pflanzer, 3 (1907), No. 17-18, pp. 269-272*).—The roots and other parts of rubber and fiber plants are considerably injured by the attacks of *Georychus cinereoargentatus*, *Rhizomys splendens*, and a number of other species of rodents.

Zoological yearbook, 1906, P. Mayer (*Zool. Jahresber., 1907, pp. VIII+606*).—As in previous numbers of this publication extended bibliographical lists are given, together with brief summaries of the more important literature which appeared during 1906 relating to the various groups of the animal kingdom.

The application of economic biology to agriculture, W. E. Collinge (*Jour. Econ. Biol., 2 (1907), No. 3, pp. 96-106*).—Attention is called to the application of biological investigation to economic agriculture, particular mention being made of the important results obtained in plant and animal breeding, the diseases of plants and animals, the control of insect enemies, and the biology of the soil.

The importance of the study of entomology; how to collect (and preserve) insects, F. L. Washburn (*Minnesota Sta. Bul. 105, pp. 29, pls. 4, figs. 61*).—This bulletin discusses the economic relations of insect life to wealth production, and gives directions for the collection and preservation of insects for study. Illustrations are given of many of the more important economic species.

Entomological memoirs, J. H. Fabre (*Souvenirs Entomologiques. Paris [1907], 10. ser., pp. 355, figs. 10*).—The author presents in a popular manner his observations on the habits and instincts of various insects. Some of the species are of considerable economic importance, particularly the cockchafers, species of Cossus, and blue-bottle fly.

[Entomological notes], C. J. S. Bethune (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 53–55, 56–60*).—During the year reports were received from a large number of localities showing an unusual amount of injury from oyster-shell bark-louse. Mention is also made of the injuries due to scurfy bark-louse, San José scale, white grubs, plant lice, and cutworms (*Peridroma saucia*). The cutworm outbreak was checked to some extent by the use of poisoned baits.

In a study of the preparation of lime-sulphur it was found that the best results are obtained when the mixture is boiled for 45 to 60 minutes in about 13 gal. of water. The color which develops in the mixture at the end of this period of boiling depends upon the brand of lime used. It is necessary that the wash be kept stirred during its application, since otherwise the lower and upper layers will have a different composition. Notes are also given on the use of air-slaked lime and arsenite of lead for asparagus beetles, banding trees for cotton moth, kerosene emulsion for oyster-shell scale, and hydrocyanic-acid gas for white fly in greenhouses (see p. 1160).

The pocket gopher, T. H. Scheffer (*Kansas Sta. Bul. 152, pp. 110–145, figs. 15*).—The study of the pocket gopher has been carried on by the author for the past 3 years. The species which occurs in Kansas, *Geomys bursarius*, is most abundant along the drainage area of the Kansas River. It digs runways in cultivated and uncultivated fields, throwing up soil at irregular intervals in the form of mounds, in this way doing much damage to alfalfa, nursery trees, orchards, truck crops, and potatoes. A single gopher may throw up several mounds daily. There is but one brood of gophers annually and the size of the litter averages four. The present Kansas laws regarding the extermination of the pocket gopher are ineffective.

It is recommended by the author that the plan of furnishing poison at the expense of a county or township be adopted. A number of traps have been devised and give fairly good results but are slower in operation than poisoning. Fumigation is unsatisfactory. The department of zoology and entomology of the Kansas Station prepares a sirup containing strychnin, which is distributed among farmers for use in poisoning pocket gophers. Shelled corn is treated with this poisoned sirup and then introduced into the burrows of the gophers.

Report of the State entomologist for the year 1906, S. Lampa (*Meddel. K. Landtbr. Styr. [Sweden], 1907, No. 121(2), pp. 32, figs. 2*).—During the year under report more or less serious injuries were noted from the attacks of *Cheimatobia brumata*, *Galeruca tenella*, the pea plant louse, ox warble fly, mosquitoes, codling moth, tussock moth, cutworms, etc. Brief notes are given on the prevalence of these insects and practical suggestions are made regarding their control.

Insects injurious to cultivated plants in Bulgaria, K. Malkoff (*Trudove Drzhav. Zeml. Opitna Stanz. Sadovo [Arb. Staatl. Landw. Vers. Stat. Sadovo], 1907, No. 2, pp. 47–54*).—A list is given of 195 species of injurious insects belonging to various orders with brief annotations regarding the locality where they are found and the host plants.

Physiology of aberrations and variations of butterflies, E. FISCHER (*Arch. Rassen u. Gesell. Biol., 4 (1907), No. 6, pp. 761–793, pl. 1*).—The literature relating to the influence of temperature changes and other external factors upon the variations of butterflies is critically examined. The author's experiments were made on species of Vanessa, Pyrameis, and Araschnia. It was found possible by means of decided temperature differences to produce striking alterations in the general color patterns of these insects.

The course of absolute inanition in Carabus morbillosus in diffused light and in darkness, G. FATTA and S. MUNDULA (*Studi Sassaresi, 5 (1907–8), Sect. 2, Sup. 2, pp. 27*).—Ground beetles belonging to the species *Carabus morbillosus*, having an initial weight of 0.71 gm., lived during complete fasting for 338 hours on an average, losing during this time 34 per cent of their weight or 0.1 per cent hourly. Beetles which were fasted in complete darkness as compared with those which were kept in the light lived longer and the hourly loss of weight was less.

On the biologies of the Rhynchophora of North America, W. D. PIERCE (*Ann. Rpt. Nebr. Bd. Agr., 1906–7, pp. 247–319, pls. 8*).—The author presents a comprehensive account of our present knowledge regarding the biology of the species of weevils which occur in the United States. Particular attention is given to the biology and economic relations of the more important species. A bibliography of the subject is appended to the article.

Coccidæ of Japan, S. I. KUWANA (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 177–231, pls. 9*).—According to the collections made by the author in Japan during the past 3 years, there are 97 species of Coccidæ in Japan, 13 of which are described as new. Brief notes are given on these species and a list is presented of other scale insects reported as existing in Japan but not observed by the author.

A special account is given of *Xylococcus matsumuræ*, a new species of scale insect observed on pines, and a general account of the anatomy, habits, and life history of *Gossyperia ulmi*.

Notes on the Egyptian cotton bug or cotton stainer (*Yearbook Khedir. Agr. Soc. Cairo, 1906, pp. 11–27, pl. 1*).—The most important species of cotton stainer in Egypt is *Oxycarenus hyalinipennis*, which is found on cotton and a number of other plants belonging to the mallow family. The pest is described in its various stages and notes are given on its life history. The number of annual generations has not been determined. In addition to the well-known fact that these and other related insects cause a staining of the cotton fiber in picking and ginning, the pest also causes serious injury by sucking the juices from the squares of young bolls. It is suggested that the insect might be to some extent controlled by hand picking, but more particularly by clean cultivation and the destruction of all rubbish in the cotton field.

Thrips on oats, R. H. PETTIT (*Michigan Sta. Spec. Bul. 38, p. 1*).—An injury to young oats resembling blight was reported as causing damage in a large part of the State. The cause of the trouble is stated to be thrips, which were present in unusual numbers.

Control of the brown ant (Solenopsis geminata) and the mealy bug (Pseudococcus citri) in pineapple plantations, W. V. TOWER (*Porto Rico Sta. Circ. 7, pp. 3*).—The brown ant seldom does any direct damage to pineapples but it attends the mealy bugs and carries them from place to place distributing them upon fresh plants. The attack is usually made on the outer rows of the plantation. Before the flower stalk develops the mealy bugs are found on the leaves near the center of the plant.

The best results in combating brown ants and mealy bugs are obtained from the use of kerosene emulsion prepared according to a formula calling for 2 gal. of kerosene, 1 pt. crude carbolic acid, 1 lb. soap, and 1 gal. of water, the stock solution to be diluted in 18 gal. of water before use. The emulsion should be thoroughly sprayed between the heart leaves of the plant. When the ant nests are immediately under or around pineapple plants it is best to spray the pests first, forcing the emulsion into the soil. Pineapple plants should not be sprayed when the fruit bud is forming.

The gipsy and brown-tail moths in New Hampshire, E. D. Sanderson (*New Hampshire Sta. Bul. 136, pp. 93–156, figs. 34*).—A general historical account is given of the introduction and spread of the gipsy moth in Massachusetts, Rhode Island, Maine, Connecticut, and New Hampshire with particular reference to the work which has been done in New Hampshire in controlling this insect. The life history of the pest is described in detail.

A similar historical and economic account is given of the brown-tail moth, together with a copy of the New Hampshire law for the control of gipsy and brown-tail moths.

Papers on deciduous fruit insects and insecticides. Grape root-worm investigations in 1907, F. Johnson (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 6, pp. 61–68, pls. 2*).—Notes are given on the conditions observed in vineyards in the Lake Erie Valley in 1907. A study was made of the amount of injury done by the grape root-worm during the year under report and experiments were carried on to determine the efficiency of spraying to control this pest. The insecticide work was done at North East, Pennsylvania. The results obtained indicate that a thorough and timely spraying of infested grapevines with arsenate of lead will control the grape root-worm to such an extent that the vineyard will produce a fairly good crop. The application of arsenate of lead should be made as soon as the first beetles appear. All parts of the foliage should be thoroughly covered. In this work about 100 gal. of liquid spray is sufficient to cover an acre. The spray formula recommended by the author calls for 5 lbs. copper sulphate, 5 lbs. of lime, and 3 lbs. of arsenate of lead in 50 gal. of water.

Papers on deciduous fruit insects and insecticides. Demonstration spraying for the codling moth (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 7, pp. 69–76*).—Demonstration experiments are reported as carried on in Virginia by S. W. Foster, Pennsylvania by F. Johnson, and Ohio by A. A. Girault for the purpose of showing the ease with which the codling moth may be controlled. In Virginia apple trees were sprayed with Bordeaux mixture containing 2 lbs. arsenate of lead to each 50 gal. A saving of 72 per cent of the crop was thus effected at a cost of 49 cts. per tree and with a net gain varying from $0.25 to $11.88 per tree. In Pennsylvania Bordeaux mixture was used containing 3 lbs. of arsenate of lead per 50 gal. of water and produced a net gain of $2.75 per tree. In Ohio similar experiments gave a net gain of about 95 cts. per tree.

The pear midge, P. Marchal (*Ann. Soc. Ent. France, 76 (1907), No. 1, pp. 5–27, figs. 14*).—During the past few years the pear midge has caused more damage than heretofore, particularly in the vicinity of Paris. The life history of this pest is described in detail with illustrations of the injuries caused by it. At least three species of parasites occur upon the pear midge in France, one of which, *Trdymus piricola*, is described as new. If the orchardist undertakes the destruction of fallen infested fruit in order to control the pear midge, this must be done promptly, otherwise the midges will escape and the operation will have no good effect. A number of other artificial remedies have been tried, some of which were fairly satisfactory. The best results were obtained from the application of sulphocarbonate of potash to the soil about infested trees. This remedy is efficient when applied at the rate of 30 kg. per acre.

Mytilaspis fulva on the roots of olives, L. PETRI (*Atti R. Accad. Lincei Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 16 (1907), II, No. 11, pp. 766–769, figs. 2*).—The roots of olives are sometimes quite badly infested with *Mytilaspis fulva.* In some instances this infestation appears not to have any apparent influence on the growth or vigor of the trees, but the introduction of the beaks of the scale insects into the tissues of the roots may favor infection with bacteria.

Thrips on cacao, H. A. BALLOU (*West Indian Bul., 8 (1907), No. 2, pp. 143-147*).—*Physopus rubrocincta* is described and an account is given of its attacks upon cacao. In preventing injury from this pest it is desirable to keep cacao trees in as healthy and as vigorous a condition as possible. If insecticide treatment should become necessary, a wash containing 4 lbs. of powdered rosin, 1 lb. of caustic soda, and ¾ pint of fish oil per 21 gal. of water is highly recommended. Kerosene emulsion and whale-oil soap compounds may also be used.

The enemies of the cocoanut palm, J. VOSSELER (*Pflanzer, 3 (1907), Nos. 17–18, pp. 275–288; 19–20, pp. 289–317*).—Brief practical suggestions are given regarding the methods for avoiding damage to cocoanut palms from various sources. The chief troubles with which the cocoanut grower has to contend are falling of unripe nuts, fungus diseases of various sorts, lightning, native thieves, monkeys of several species, birds, and particularly insects. Among the insect enemies especial mention may be made of *Oryctes boas*, *Rhynchophorus phoenicis*, and *Tetralobus flabellicornis.*

Departmental notes on insects that affect forestry, No. 3, E. P. STEBBING (*Calcutta: Govt., 1906, pp. VIII+469, pls. 8*).—Biological and economic notes are presented on a large number of species of insects which attack conifers, acacia, bamboos, cocoanuts, oaks, sandal wood, and other important forest trees. A number of new species of forest insects are described and mention is made of their natural enemies.

Forest insects, M. ZAPPELLA (*Coltivatore, 53 (1907), No. 51, pp. 773–778*).—A list is given of 36 species of insects which are more or less injurious to forest trees of various species, particularly conifers, oaks, willows, and elms. Attention is also called to the economic importance of some of these species.

The life history and injurious attacks of Hylecoetus dermestoides, STROHMEYER (*Naturw. Ztschr. Land u. Forstw., 5 (1907), No. 11, pp. 513–523*).—*Hylecoetus dermestoides* is commonly believed to attack only dead or injured timber. The author found, however, that the adults begin to fly about in April and May and lay their eggs upon various kinds of deciduous and coniferous trees. Practical remedies for this pest have not yet been devised.

The utilization of insect parasites in the control of injurious insects, P. MARCHAL (*Ann. Inst. Nat. Agron., 2. ser., 6 (1907) No. 2, pp. 281–354, figs. 26*).—The general rôle of insect parasites is discussed by the author with reference to the habits of a number of the most important insect parasites. A biological classification is given of the various forms and degrees of parasitism. It is held that the value of parasitic insects to agriculture has been increased by the great prevalence of injurious insects made possible by extensive cultivation of agricultural crops.

As special illustrations of work already done in the introduction of beneficial parasites, mention is made of *Novius cardinalis*, parasites of fruit flies, *Scutellista cyanea*, parasites introduced for the control of gipsy and browntail moths, etc.

Fumigation with cyanid of potassium for white fly, H. L. Hutt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 150, 151*).—In greenhouses with the ordinary miscellaneous collection of plants it was found that fumigation could be accomplished without injury to the plants and with good results in the destruction of white fly and other greenhouse pests when the gas was evolved from a mixture of ¼ oz. cyanid of potash, ½ oz. of sulphuric acid, and 1 oz. of water per 1,000 cu. ft. of space.

Paris green, C. D. Woods and H. H. Hanson (*Maine Sta. Bul. 154, pp. 109–118*).—Samples of Paris green offered for sale in Maine were analyzed and found to contain in nearly all cases the requisite amount of arsenic. In a few samples the arsenic was not all combined, but showed too high a percentage of soluble arsenic. Small quantities of sodium sulphate and sand were observed as incidental impurities in samples and in a few cases the water content was rather high. Examination for the purpose of determining the relative fineness of the material showed that the particles of Paris green in the samples examined were quite uniform in size and regularly rounded. Formulas are given for the preparation of Paris green as a spray either alone or in combination with Bordeaux mixture.

On the bionomics of certain calyptrate muscidæ and their economic significance, with especial reference to flies inhabiting houses, C. G. Hewitt (*Jour. Econ. Biol., 2 (1907), No. 3, pp. 79–88*).—In the group of calyptrate muscidæ are found a number of beneficial parasitic species and also some of the most annoying and injurious species of flies, including tsetse flies, the common house fly, etc. Attention is called to the biology and economic importance of these species.

Tsetse flies, F. Stuhlmann (*Arb. K. Gsndhtsamt., 26 (1907), No. 3, pp. 301–383, pls. 4, figs. 28*).—A detailed study was made of the appearance, habits, and life history of *Glossina fusca* and *G. tachinoides*. The various features of the internal and external anatomy of these insects are described in detail, particular attention being devoted to those anatomical structures which may bear upon the transmission of disease by the insects in question. From laboratory experiments it appeared that tsetse flies require more food in a dry air than in a moist air. The author considers that there is more prospect of practically controlling trypanosome diseases in animals by efforts directed toward the destruction of the trypanosomes in affected animals than by attempts to eradicate the flies.

Ox warble flies, D. Turner (*Agr. Students' Gaz., n. ser., 13 (1907), No. 5, pp. 141–144*).—Attention is called to the great damage annually caused by the ox warble fly. The extent of infestation of these pests has been somewhat reduced in all localities where cattle have been systematically greased with a mixture intended to prevent the adult flies from laying their eggs.

Notes on ticks, C. Warburton (*Jour. Econ. Biol., 2 (1907), No. 3, pp. 89–95, pl. 1*).—An analytical table is presented for the identification of the genera of Ixodidæ and Argasidæ. Notes are also given on some of the more important species of these families.

Agriculturally important ticks in Africa, W. Dönitz (*Die wirtschaftlich wichtigen Zecken mit besonderer Berücksichtigung Afrikas. Leipsic, 1907, pp. V+127, pls. 6*).—A great variety of ticks infest domestic animals in Africa. The author has, therefore, undertaken to present a systematic and economic account of these pests. The general anatomy and life history of ticks is described and a statement is given of the systematic arrangement of species. Particular stress is laid upon those species of ticks which cause serious annoyance and loss of condition to domestic animals or are concerned in the transmission of diseases.

Report on experiments with a proprietary remedy for cattle ticks, F. Lahille (*Bol. Min. Agr. [Buenos Ayres], 8 (1907), No. 3–4, pp. 341–369*).—A proprietary tick remedy, the analysis of which is not given, was tested as a dip for cattle infested with ticks. The results were rather encouraging in that from 60 to 70 per cent of the ticks were killed without apparent injury to the cattle.

Notes on the tastes of bees in color, Scott-Elliot (*Trans. and Jour. Proc. Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc., 18 (1905–6), pt. 1, pp. 141–143*).—In early spring when there are but few flowers in bloom these flowers are visited by all kinds of insects which seem to make no distinction of color. Later, however, when there is a greater variety of flowers for choice the author maintains that bees show a decided preference for bright blue or red flowers.

FOODS—HUMAN NUTRITION.

Studies of the toughness of meat and its cause, K. B. Lehmann et al. (*Arch. Hyg., 63 (1907), No. 2, pp. 134–179, figs. 2*).—Apparatus is described which is designed to measure the relative toughness of meat and other foods, more particularly the resistance of meat to a cutting surface as in chewing. By means of this apparatus the comparative resistance of a large number of different kinds and cuts of meat was measured and the results are discussed with reference to the effect on toughness of the proportion of connective tissue present. The author also studied the effect of hanging, cold, and cooking upon toughness. When meat was boiled for 5 minutes it was found that toughness diminished 8 per cent and when cooked for 2 hours 16 per cent.

The toughness of vegetable foods and the changes which cooking brings about, K. B. Lehmann, P. Gunkel, and J. Wilms (*Arch. Hyg., 63 (1907), No. 2, pp. 180–182*).—Using the methods outlined above the authors measured the decrease in toughness which vegetable foods undergo when cooked. In the case of peas the relative resistance to the cutting surface, i. e., the toughness, was 220 when cooked for 15 minutes, when cooked for an hour in distilled water 39, and when cooked for an hour in spring water 65. In general cooked vegetable foods are $\frac{5}{8}$ to $\frac{9}{10}$ less tough or resistant than the raw foods.

[Cooking tests], Mary U. Watson (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 240–245*).—Several cooking tests were carried on as a part of the work of students in home economics. Beans were soaked in limewater, hard water from the local water supply, and the same hard water softened by boiling and also by the addition of bicarbonate of soda. After soaking the beans were cooked in the hard water and the water softened by boiling and also by bicarbonate of soda.

It was found that beans soaked in softened water increased most in weight. Three hours' cooking at the simmering point did not soften and disintegrate the cellulose of beans soaked and cooked in hard water, and beans thus cooked, it was concluded, are neither palatable nor digestible.

"The harder the water in which beans cooked, the same length of time, the more unpalatable and indigestible the beans, and the more proteid lost in cooking.

"Beans cooked in water softened by boiling have a much more appetizing appearance than those cooked in water softened by baking soda. They keep their shape better and are only very slightly colored yellow.

"Beans cooked in water softened by boiling are the most mealy. They would therefore be most digestible, as the saliva could most easily mix with the particles of the bean."

Beans cooked in water softened by boiling were the most palatable of those tested and the most nutritious since they lost the least of their nutritive constituents by soaking and cooking, and in general the best results were obtained with water which had been softened in this way.

The relative merits of domestic methods of cooking strong smelling vegetables (onions and cabbage) were studied. It was found that vegetables simmered in a pot with the lid on had a much better color than those boiled in an uncovered pot, though they required a longer time for cooking. The flavor was improved by the addition of salt though somewhat more substance was removed when they were cooked in salted water, but this is not a matter of much importance as such foods are eaten for flavor rather than nutritive value. "When simmering there is less steam escaping and what little there is is not allowed to escape owing to the closely fitting cover. There is therefore much less odor escaping during the cooking."

Different methods of mixing fat in dough were also studied and better results were obtained in making biscuit when the shortening was rubbed in than when it was melted and mixed with the dough. In the case of cookies made with creamed butter, with butter rubbed into the flour and with melted butter added to the flour, practically the same results were obtained in every case.

On the composition of the shoots of Aralia cordata, T. Takeuchi (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1907), No. 3, pp. 465–468*).—An analysis of this Japanese vegetable, which is eaten both raw and cooked, is reported. In composition it resembles asparagus.

Breakfast foods, R. Harcourt (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 77–80*).—A brief summary of data obtained in experiments on breakfast foods noted from a previous publication (E. S. R., 19, p. 863).

Some notes are also given regarding tests not yet completed of the milling quality of Ontario fall wheat.

Concerning olive oil, Droste (*Apoth. Ztg., 22 (1907), Nos. 56, pp. 589, 590; 57, pp. 598–600*).—From investigations undertaken with a view to judging of the quality of olive oil, the author found that exposure to light from incandescent gas burners induced changes in the appearance, flavor, odor, and chemical constants of oil, but that cold had no effect. Molds induced decided changes in the oil and exposure to Roentgen rays lowered the iodin content. Olive oil which contained a trace of sesame oil, the author states, gave a decided rose color with an alcoholic solution of furfurol and hydrochloric acid.

Cocoanut butter and other artificial culinary fats, L. E. Andés (*Kokosbutter und andere Kunstspeisefette. Vienna and Leipsic, 1907, pp. VIII+240, figs. 37*).—In this handbook the author has discussed the methods of manufacture of cocoanut fat, palm oil, and cocoanut butter, new methods of manufacturing oleomargarine, and related questions which have to do with commercial culinary fats.

Canarium commune seed oil, P. Pastrovich (*Chem. Ztg., 31 (1907), No. 63, pp. 781, 782, figs. 4*).—The kernels of the so-called Java almond yield by pressing 56.12 per cent of an oil which is yellow in color, odorless, of an agreeable flavor, and, according to the author, suitable for culinary purposes. The melting point, iodin value, and other constants of expressed and extracted oil were determined and the air-dried seeds were analyzed, their percentage composition being as follows: Water 9.03, protein 12.24, fat 65.73, nitrogen-free extract 6.00, crude fiber 3.81, and ash 3.19 per cent. No fat-cleaving ferment could be detected in the nuts.

Sulphurous acid in food materials, W. Kerp (*Chem. Ztg., 31 (1907), No. 85, pp. 1059–1062*).—A summary and discussion of recently published data on the compounds formed by sulphurous acid in foods.

Tin cans and the way they are attacked by acid and different preserved foods, K. B. Lehmann (*Arch. Hyg., 63 (1907), No. 1, pp. 67–122*).—On the basis of investigations carried on by the author and his students, the action of acids and foods upon tin is discussed with relation to the canning industry.

The amount of tin dissolved by dilute acids is directly dependent upon the proportion of free oxygen available. Lacquering the inside of the can protected the tin 3 to 6 months. The "watered" or "moire" appearance often noted in the interior of tin cans is due to the action of the acid of the can contents; that is, to the fact that some of the tin has been slowly dissolved owing to the presence of small amounts of oxygen (air) in the can. Theoretically the solution of tin should proceed rapidly after the can is opened since the supply of oxygen (air) is then abundant, but such was not found to be the case with sweet foods or with animal foods, as the solution is hindered in the one case by the sugar and in the other by the fat present. The viscosity of the can contents has also an important bearing on the amount of tin dissolved. The retarding effect which sugar exercises on the solution of the tin is due to the fact that it changes the ionization of the tartaric acid. It was also found that copper and iron were less attacked by acids in the presence of sugar than was the case when sugar was absent.

[Spoiling of canned peas], E. W. Duckwall (*Canner and Dried Fruit Packer, 25 (1907), No. 3, pp. 25, 26, figs. 2*).—On the basis of investigations the author discusses the micro-organisms which cause swelling of canned peas, souring of can contents, cloudiness of juice, etc., and gives general directions for avoiding such troubles, especially in commercial canning.

Report on the sanitary and hygienic examination of foods and condiments, 1904–1906, A. Siew (*St. Petersb. Med. Wchnschr., 1907, No. 10, pp. 89–91; abs. in Hyg. Zentbl., 3 (1907), No. 11, p. 329*).—A report of the examination of milk, butter, sausage, and other foods at the laboratory of bacteriology and chemistry at Libau.

Food analyses No. XI, E. H. S. Bailey and H. L. Jackson (*Bul. Kans. Bd. Health, 3 (1907), No. 11, pp. 212–216*).—Of 16 samples of meat (mostly Hamburg steak) examined for the presence of chemical preservatives, 3 samples were passed. Data are also given regarding the inspection of a number of samples of beverages, flavoring extracts, sauerkraut, etc.

Report on the work of the station for wine chemistry, C. von der Heide (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1906, pp. 223–264, figs. 3*).—Analyses of pure natural wines from Prussian vineyards (vintage of 1905), of musts from the vintage of 1906, and of old Bordeaux wines are reported, as well as determinations of volatile acids in wine and studies of wine analysis.

Small quantities of lead and arsenic were found in wine and wine products made from grapes from vines sprayed with lead arsenate, and the need of improved methods of spraying and of methods of removing traces of lead and arsenic from the wine is pointed out.

Tenth annual convention of the Association of State and National Food and Dairy Departments (*[Proc.] Conv. Assoc. State and Nat. Food and Dairy Depts., 10 (1906), pp. 349*).—This volume contains a number of papers by different authors presented at the tenth annual convention of the association, as well as minutes of the convention, committee reports, and similar data.

Food legislation during the year ended June 30, 1907, W. D. Bigelow (*U. S. Dept. Agr., Bur. Chem. Bul. 112, pts. 1, pp. 155; 2, pp. 155*).—A compilation of American food legislation during 1907. Part 1 includes the Federal laws and the laws of the States and Territories, Alabama to New Hampshire, inclusive, and part 2, the laws of the States and Territories, New Jersey to Wyoming, inclusive.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 89, pp. 2; 90, pp. 3; 91, pp. 3; 92, pp. 2*).—The subjects taken up are an amendment to Food Inspection Decision 76, relating to the use in foods of benzoate of soda and sulphur dioxid, the labeling of foods and medicinal mixtures for stock and poultry, the labeling of Mocha coffee, and the use of copper salts in the greening of foods.

Regulations governing the meat inspection of the United States Department of Agriculture (*U. S. Dept. Agr., Bur. Anim. Indus. Order 150, pp. 48*).—The regulations herein prescribed became effective April 1, 1908, and cover "inspection, reinspection, examination, supervision, disposition, and method and manner of handling live cattle, sheep, swine, and goats, and the carcasses and meat-food products of cattle, sheep, swine, and goats, for the sanitation of the establishments at which inspection is maintained, and for the transportation of meat and meat-food products from one State or Territory or the District of Columbia to any other State or Territory or the District of Columbia or to any place under the jurisdiction of the United States or to any foreign country." The law under which these regulations are made is quoted.

Report of inspections at certain of the meat canning factories in the United States of America as affecting the supply of preserved meat to the British army, P. E. F. Hobbs (*London: Govt., 1906, pp. 67, pls. 4*).—The condition of American stock yards, the methods employed in canning, provisions for inspection, and related questions are discussed on the basis of personal observation.

Indian manual of military cooking (*Calcutta, 1906, pp. 86, figs. 5*).—This volume gives data regarding the selection of food supplies for troops in India, camp and field cookery, and related questions, as well as recipes for the preparation of a large number of foods.

Food notes in Shantung, North China, Lilian E. Tingle (*Boston Cooking-School Mag., 12 (1907), No. 4, pp. 155–159, figs. 3*).—A description of Chinese foods and food customs.

According to the author, in Shantung wheat is the staple cereal, rice being eaten in small quantity. Millet and soy beans are also important crops and large amounts of green vegetables and roots are grown. Of animal foods, pork, goat meat, and mutton are common, while beef is almost unknown except among beef-eating Mohammedans. Fowls, ducks, eggs, and all kinds of fish are also common and are eaten in large qauntities.

Some Japanese vegetable food materials with special reference to preserved army stores, E. Senft (*Pharm. Praxis, 5 (1906), No. 12, pp. 481–491; 6 (1907), Nos. 1, pp. 1–8; 2, pp. 49–56; 3, pp. 81–89; 4, pp. 122–132; 5, pp. 163–168; 6, pp. 208–220, figs. 11*).—The preserved foods examined, which were used in the Japanese army during the recent war with Russia, include a sort of biscuit or cracker made from dried fern, a number of sorts of marine algæ and lichens, soy beans and other legumes, bean cheese or curd and other soy-bean products, pickled or bottled onions, salted radishes, canned or preserved fruits or vegetables, etc. The article includes descriptive and other matter and a summary of data regarding composition, food value, and related questions. A list of the principal food plants of Japan is appended.

Rice and beri-beri, W. Fletcher (*Lancet [London], 1907, I, No. 26, pp. 1776–1779*).—In the experiments reported uncured rice, that is, ordinary white rice, and cured rice, which is boiled and dried before being milled, were fed under uniform conditions to insane hospital patients in the Malay States. It was found that beri-beri resulted from eating the uncured rice but did not occur when the cured rice was eaten. The ultimate cause of the beri-beri was not ascertained. The article contains considerable information regarding diet in the Malay States. The amounts of meat, rice, etc., comprising the daily ration.

of the inmates of the insane hospital are stated. [The calculated nutritive value of the ration is 85 gm. protein and 3,355 calories of energy per man per day.]

Experimental studies relating to ship beri-beri and scurvy, A. HOLST (*Jour. Hyg. [Cambridge], 7 (1907), No. 5, pp. 619–633*).—Experiments on the effect of feeding single foods, undertaken with pigeons and chickens, showed that if long continued such rations caused degenerative changes. For instance, long continued feeding of cooked meat or coarsely ground Indian corn as an exclusive diet caused polyneuritis in chickens. General conclusions were not drawn and the work was continued with mammals.

Experimental studies relating to ship beri-beri and scurvy, A. HOLST and T. FRÖLICH (*Jour. Hyg. [Cambridge], 7 (1907), No. 5, pp. 634–671, pls. 2*).—The experiments which were made with guinea pigs showed that a one-sided diet (grain, groats, bread, or dried potatoes) produced a disease that closely corresponded to human scurvy. A one-sided died of fresh cabbage or fresh potatoes did not produce this disease. It was further observed that the disease was favorably influenced by different foods which are commonly classed as antiscorbutics. It was found that cabbage which was boiled for half an hour at 110° C. lost a considerable part, though not all, of its protective power.

The effects of cooking food upon the health of animals were taken into account in a number of the experiments. The authors have not been able to explain "in an unmistakable way, why the one-sided diets, . . . produce scurvy."

Metabolism and practical medicine, C. VON NOORDEN (*Chicago, 1907, vols. 1, pp. XVI+452; 2, pp. XVI+525; 3, pp. XX+527-1320*).—Volume I, entitled The Physiology of Metabolism, is edited by A. Magnus-Levy and contains discussions by different authors on such fundamental subjects as digestion and absorption, fate of food stuffs in the tissues, metabolism in man, influence of muscular work on metabolism, and metabolism in old age.

Volumes II and III are each entitled The Pathology of Metabolism, by C. von Noorden et al. The former contains summaries by different authors on metabolism in hunger, in chronic starvation and overfeeding, and in different diseases, and summarizes and discusses the pathology of metabolism and constitutes an extensive study and discussion of available data on the pathology of metabolism. The latter is an extended summary and discussion of available data on diet in relation to diabetes mellitus, gout, obesity, diseases of the skin and other diseases, and the effect of mineral waters, baths, drugs and poisons, light and Roentgen and radium rays upon metabolism.

The bibliographical summaries which accompany the different sections are important features and the work as a whole constitutes an extended summary of available data on the subjects included. The English edition is edited by I. W. Hall.

The common bacterial infections of the digestive tract, C. A. HERTER (*New York and London, 1907, pp. XII+360*).—In this volume, which is largely a medical treatise summarizing the author's investigations and other data on bacterial infection of the digestive tract as a cause of disease, the author has discussed the effect of contaminated food on public health and related questions and summarized much data of interest in relation to dietetics.

Studies of the elementary composition of liver, W. PROFITLICH (*Arch. Physiol. [Pflüger], 119 (1907), No. 9–11, pp. 465–482*).—Dried beef liver, freed from fat, ash, and glycogen, contained practically the same amount of nitrogen as liver from a well fed dog. Considerable variations were noted in the carbon and hydrogen content of both sorts of liver.

The general mechanism which transforms glycogen into glucose in muscles and animal tissues, F. MAIGNON (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 18, pp. 730–732*).—According to the author, his experiments show that muscles contain an amylase which transforms glycogen into glucose. The reaction is increased by anything which brings the amylase and glycogen into more intimate contact.

A method of recording the loss of weight through the air passages and skin of man, W. P. LOMBARD (*Abs. in Zentbl. Physiol., 21 (1907), No. 15, pp. 484, 485*).—In a paper presented at the International Congress of Physiology, Heidelberg, 1907, the author describes a balance which registers changes in weight with great accuracy at very frequent intervals and which is adapted to experiments with man. The carbon dioxid lost in the breath is very nearly equivalent in weight to the oxygen consumed, and so the losses in weight which are observed are due principally, the author points out, to the excretion of water vapor.

ANIMAL PRODUCTION.

The composition of some Transvaal fodders, H. INGLE (*Transvaal Agr. Jour., 6 (1907), No. 21, pp. 51–65*).—Tall fescue and other green fodders, oat hay, Boer manna hay (*Setaria italica*), teff hay, alfalfa hay and other leguminous hays, beets, mangels, cornstalks, and other feeding stuffs were analyzed, proximate and ash constituents being determined in the majority of cases.

The reported data are discussed with special reference to the author's belief that local grown oat hay and corn (mealies) do not supply the required mineral matter for horses and mules (E. S. R., 19, p. 670) and should be supplemented by other feeding stuffs. "Some of these, e. g., lucern, cowpeas, velvet beans, and certain millets can readily be grown here and give very remunerative yields."

Composition of "joegee beans" (*Transvaal Agr. Jour., 6 (1907), No. 21, pp. 67, 68*).—The seed were identified as *Voandzeia subterranea* and proximate and ash constituents were determined.

Locust beans, G. B. RAVNDAL (*Mo. Consular and Trade Rpts. [U. S.], 1907, No. 327, pp. 252, 253*).—A summary of data on the use of carob beans in Cyprus and France for cattle feeding, for making a molasses like sirup, alcohol, etc.

Rice glutina or gluten: An economical concentrated feed, R. DUMONT (*Semaine Agr. [Paris], 26 (1907), No. 1382, p. 365*).—The value of rice gluten, a by-product in rice milling, is discussed and analyses of this material quoted. The author states that he has found it a satisfactory feeding stuff for poultry, dairy cows, and other farm animals.

Waste bananas as stock feed (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 9, p. 1022*).—A brief note on the successful use as a cattle feed in Trinidad of bananas broken up with a root pulper and mixed with some cocoanut or cotton-seed meal and a little molasses. The mixture, it is said, is used to the best advantage for feeding milch cows, growing stock, and draft oxen, and "all these animals consume it with relish. It is not so suitable for mules or other stock, and if given to pigs or poultry should first be cooked."

The inspection of feeding stuffs in 1907, F. W. MORSE (*New Hampshire Sta. Bul. 133, pp. 70–76*).—Under the provisions of the State law, a number of samples of cotton-seed meal, linseed meal, distillers' and brewers' grains, gluten feeds, hominy feed, wheat feed, molasses feed, grain mixtures, animal meal, beef scraps, bone meal, and commercial feeds were analyzed.

With the exception of the cotton-seed meals, which were deficient in protein, "the different classes of cattle foods which were analyzed during the past season gave results which agreed in nearly every case with the guaranties of the manufacturers."

[Condimental and commercial feeding stuffs], W. P. GAMBLE (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 89–94*).—Analyses of a number of samples of condimental and stock feeds, with microscopical examinations in some cases, indicated that these goods contained in addition to grains or similar filler small quantities of a variety of substances, such as fenugreek, gentian, cayenne, and charcoal, which possess medicinal qualities to which "is attributed the wonderful nutritive and curative properties claimed for them."

"The nutritive value of 'stock foods' is thus shown to be no greater than that of the ordinary grains of which they are largely composed. Their medicinal value depends largely upon the aromatic seeds and roots used as a tonic for the stomach, on charcoal as an absorbent, and on the purgative effect of Epsom and Glauber salts. The quantity recommended to be fed is usually so small that very little nutritive effect can be expected unless the material be fed for a considerable length of time."

Analyses are also reported of a number of samples of bran, buckwheat feed, gluten feed, gluten meal, gluten liquid, nut-oil cake, linseed meal, whole linseed, malt combings, corn meal, cotton-seed meal, beet meal, rice meal, bean meal, a molasses feed, commercial feeds, and Manitoba weed seeds.

The comparative value of different groups of feeding stuffs is discussed with relation to feeding farm animals. The weed seeds contained 9.82 per cent water, 13.84 per cent protein, 4.47 per cent fat, 63.90 per cent nitrogen-free extract, 4.78 per cent crude fiber, and 3.19 per cent ash. As the author notes, the weed seeds judged by composition would have a decided nutritive value, but when fed to chickens the results were not satisfactory and many of the chickens died. "It is believed that the weed seeds contain aromatic compounds which are poisonous to poultry."

Results of feeding stuff control at the government experiment stations, 1906–7, VAN DER ZANDE and KNUTTEL (*Verslag. en Meded. Dir. Landb. Dept. Landb. Nijr. en Handel, 1907, No. 5, pp. 73–79*).—Results of the feeding stuff inspection work of the Dutch experiment stations.

Fresh and dried potatoes in metabolism of Herbivora, O. HAGEMANN and M. S. KARPOW (*Landw. Jahrb., 35 (1906), No. 4, pp. 371–402*).—In experiments with sheep fresh potatoes were compared with so-called potato flakes, a commercial feeding stuff made by drying potatoes in thin sections after they have been steam cooked. The digestibility of the rations was determined, as well as the income and outgo of nitrogen, and respiration experiments were made in which the respiratory quotient was determined.

According to the authors, 1,200 gm. of fresh potatoes per day fed with 976 gm. of clover hay induced a gain of 17 gm. protein and 11.5 gm. fat, while the potato-flake ration, made up of 276 gm. of dried potatoes and 882 gm. of clover hay, induced a gain of 29.7 gm. protein and 30.4 gm. fat. The quantity of flaked potatoes fed was equivalent as regards dry matter and organic matter to the fresh potatoes.

The utilization by Herbivora of the amid mixtures occurring in molasses, W. VÖLTZ (*Arch. Physiol. [Pflüger], 117 (1907), No. 10–12, pp. 541–563*).—The author's experiments made with sheep led to the conclusion that the amids occurring in sugar-beet molasses can, within wide limits, serve in the same way as protein in the metabolism of full-grown Herbivora. He regards it as highly probable that Herbivora have the power to build up the nitrogen compounds of higher molecular value from a small number of amid substances

Further experiments on the effect of asparagin on nitrogen metabolism and gains in the animal body, M. MÜLLER (*Arch. Physiol. [Pflüger], 117*

(1907), No. 10–12, pp. 497–537, dgm. 1).—From the experimetnal data reported the author comes to the conclusion that when asparagin embodied in zelloidin, is fed to Carnivora (dogs) as a part of a productive ration, the gains in nitrogen are nearly twice as great as when free asparagin is used. Like quantities of nitrogen (1 or 2 gm.), in the form of blood albumin or asparagin inclosed in zelloidin have practically the same value as regards gains in nitrogen, provided the deficiency in energy value of the asparagin is made good. In the author's opinion the physiological equivalent of asparagin and protein is not established and the ultimate effects must be taken into account. He believes that the unsatisfactory results obtained by earlier experimenters with asparagin and amids in general are due to the fact that they have been mixed directly with the ration. Other earlier work has been noted (E. S. R., 19, p. 169).

Comments on the above report, C. LEHMANN (*Arch. Physiol. [Pflüger], 117 (1907), No. 10–12, pp. 538–540*).—A controversial article.

Additional feeding tests comparing dried beet tops, dried beet chips, sour beet tops, and meadow hay, W. SCHNEIDEWIND and D. MEYER (*Illus. Landw. Ztg., 27 (1907), Nos. 60, pp. 529, 530; 61, pp. 537, 538*).—Although smaller quantities of dried beet leaves were fed in tests with sheep and steers than was the case in earlier tests (E. S. R., 19, p. 67), the same conclusion was reached, namely, that dried beet leaves do not have greater nutritive value than meadow hay of medium quality.

Farm live stock of Great Britain, R. WALLACE (*Edinburgh and London, 1907, 4. ed., pp. XXXI+758, pls. 214, figs. 66*).—The author states that this work has been rewritten and more than doubled in size. In the revision special attention has been paid to the history of various breeds of cattle and references have been made to sources of information. The subject of "home" or "first-aid" of farm animals has been exhaustively dealt with. The volume as a whole constitutes a handbook of information on cattle, horses, sheep, and farm animals in general.

Number and farm value of farm animals in the United States, 1867–1907 (*U. S. Dept. Agr., Bur. Statis. Bul. 64, pp. 5–145*).—This bulletin presents in tabular form statistics of the number, average farm price, and value of horses, mules, milch cows, other cattle, sheep, and swine by States and by years from 1867 to 1907, inclusive.

Growing cattle in western Nebraska, W. P. SNYDER (*Nebraska Sta. Bul. 105, pp. 23, figs. 4*).—When 75 steers were dehorned and turned on pasture they lost on an average 27 lbs. per head in a month as compared with 19 lbs. per head in the case of similar steers which had not been dehorned. Immediately after this the steers were taken to another locality and pastured for 7 months. The dehorned steers showed an average gain of 253 lbs. and those not dehorned 266 lbs. Considering, however, that dehorned steers sell for a higher price for feeding purposes, the author calculates that the dehorned lot was the more profitable.

Mixtures of alfalfa hay and prairie hay and of alfalfa hay and cane hay 1:1 were compared with each of these hays alone, using 5 lots of 20 calves each. A ration of 2 lbs. of corn and oats per head per day was fed in addition to the hay. The daily gain in 116 days ranged from 0.30 lb. per head on cane to 1.23 lbs. on alfalfa but was almost as great on the mixed hay rations as on the alfalfa alone, being 1.14 lbs. on alfalfa and prairie hay and 1.20 lbs. on alfalfa and cane hay. The hay required per pound of gain ranged from 10 lbs. on alfalfa alone to 36.66 lbs. on cane alone and the greatest range in grain was also noted with these two lots, being 1.62 and 5.04 lbs., respectively. The gain was most cheaply made on alfalfa, costing 2.82 cts. per pound and was most expensive on cane hay, costing 7.83 cts. per pound.

The question of these different hay rations was further studied with 5 lots of 18 steers each for a period of 120 days beginning December 1 and continuing 4 months. No grain was fed in addition to the hay. On the cane hay ration there was an average daily loss of 0.533 lb. per head and on the prairie hay ration of 0.15 lb. per head. On the other rations there was a gain ranging from 0.51 lb. on alfalfa and prairie hay 1 : 1 to 0.76 lb. on alfalfa and cane hay 1 : 1. The total gain made by the cattle during the winter was 2,754 lbs. It is stated that during the next 6 months they gained 22,130 lbs., the cost of a pound of gain in the 2 cases being 16.77 and 1.73 cts. per pound, respectively.

Brief notes are given regarding a duplication of the last 2 tests referred to. Quotations from the author's general conclusions follow:

"Alfalfa hay produces much larger and cheaper gains than prairie hay or cane hay when each is fed alone to cattle.

"A ration one-half alfalfa and one-half prairie hay or one-half alfalfa and one-half cane hay gives approximately the same gains as a full ration of alfalfa.

"Yearling steers will not hold their weight during the winter on prairie hay or cane hay alone, but will make fair gains on a ration of one-half of either of these and one-half alfalfa.

"For wintering cattle it is more profitable to feed a mixed forage ration than to feed any single kind of forage.

"If we consider steers worth 50 cts. per hundredweight more in the spring than in the fall previous, they will pay a good profit on the food consumed when this ration consists of alfalfa hay, or of one-half alfalfa hay and one-half either prairie hay or cane. When either prairie hay or cane is fed alone, it makes a small loss at the price charged in this experiment for hay and cane."

Fattening steers for export, G. E. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 157-161*).—The relative merits of long and short periods of feeding were tested with 2 lots of 8 steers each, both lots being fed hay, mixed grain, roots, and silage.

With the lot fed 69 days the average daily gain was 2.21 lbs. per head and the cost of a pound of gain 7.15 cts. With the steers fed for 126 days the average daily gain was 1.95 lbs. per head and the cost of a pound of gain 7.25 cts.

"In the case of the steers used in this experiment, the short keep steers were worth 46 cts. per hundredweight more than the long keep steers, to buy as feders. . . . The lighter and thinner the steer, the less he is worth per pound to buy as a feeder."

When 8 steers fed tied were compared with 4 fed loose in the stall, it was found that the average gains of the 2 lots in a 69-day test were 2.21 and 2.62 lbs. per head and the cost of a pound of gain 7.15 and 6.59 cts., respectively. "The loose steers made larger gains and cheaper gains than the tied steers. The loose steers consumed more meal in proportion to their live weight than the tied steers, and apparently made better use of what they consumed. The loose steers always had good appetites and were not so easily put off their feed as the tied steers. The results this year are in harmony with last year's results [E. S. R., 19, p. 68], but the experiment is being repeated."

Inverted starch for calf feeding (*Deut. Landw. Presse, 34 (1907), No. 88, p. 698*).—A very brief note on the experimental use of starch inverted with diastasolin.

Indian cattle in Jamaica, B. S. Gosset (*West Indian Bul., 8 (1907), No. 3, pp. 229-240*).—Breeds of Indian cattle, their value as draft, dairy, and meat animals, and similar topics are discussed; information with reference to the success obtained with these cattle in Jamaica is summarized, and the possibilities of this race of cattle under local conditions are pointed out.

Sheep breeding, F. W. WILSON (*Arizona Sta. Rpt. 1907, pp. 222, 223*).—A brief note on breeding experiments with Tunis, Oxford, Shropshire, and Rambouillet rams and hardy native ewes. The cross-bred Tunis-native lambs raised "are vigorous, active, and early maturing. The general conformation is on the order of the Tunis with an improved quality of wool over that of the Tunis. The large tail of the Tunis is lacking in the cross-breds. At birth the lambs are of various colors, brown or tawny predominating. Later the color fades to a brownish white."

Pork production at the Delta Station, J. W. FOX (*Mississippi Sta. Bul. 107, pp. 7*).—A brief account is given of the pigs raised from 10 sows and marketed at an average age of about 10 months. Thirty-two sold on foot averaged 175.5 lbs. in weight and 85 dressed averaged 135.4 lbs., while 5 pigs were sold for breeding purposes. The calculated net profit was $803.

The sows were fed shorts and corn at farrowing time and 2 weeks after farrowing were pastured and fed corn only. The pigs were fed corn and shorts until they were about 3 months old, with the idea of giving them "a vigorous start that they may make good use of the pasture, which, after all, is the cheapest factor in pork production."

The system of pasture rotation followed included Bermuda grass, Dwarf Essex rape and red clover, sorghum, and cowpeas planted in corn.

According to the author, some of the important features which contributed to the profit were the following:

"At farrowing time the sows were separated and given comfortable quarters, and the young pigs were given extra attention.

"The herd was kept free from lice, and were not allowed to sleep in dusty beds.

"Good pastures were provided all the year, thus insuring large, strong litters, and a healthy herd, and also cheap pork.

"The farm is fenced, making it possible to fatten the hogs largely on peas planted in the corn as a catch crop for fertilizing purposes. This crop gives the South a distinct advantage over other sections, and this feature of the work can not be too strongly urged. The fact that the peas can be converted into money without any cost of harvesting should add an additional incentive to grow more corn and peas and thus improve the land, handle the farm with less labor, and keep the cotton money at home."

Pork production, D. A. GAUMNITZ, A. D. WILSON, and L. B. BASSETT (*Minnesota Sta. Bul. 104, pp. 63–119, figs. 13, dgms. 9*).—Tests are reported of the relative merits of feeding corn and of allowing pigs to gather it themselves, which is termed "hogging off" corn.

In the first test both the pigs fed ear corn in a yard and those allowed to gather the corn in the field were each given in addition shorts in the proportion of a pound per day per 100 lbs. live weight. The pigs allowed to gather the corn were confined to one acre at a time by means of wooden hurdles. In 7 weeks the 26 pigs gathering their own feed made an average daily gain of 1.3 lbs. per head, while the 13 pigs fed in a yard made an average daily gain of 0.98 lb. per head.

In the second year's test, made under practically the same conditions, snapped corn was also included in the comparison. The average gain of 32 pigs fed in the field 51 days was 1.44 lbs. per head per day, of 8 pigs fed snapped corn 1.11 lbs., and of 8 pigs fed ear corn 1.09 lbs.

Considering both tests, the pigs gathering corn in the field required 6.14 lbs. of ear corn and 1.21 lbs. of shorts per pound of gain and those fed corn in yards, 7.02 lbs. of ear corn and 1.57 lbs. of shorts.

"Why hogs do better in the field and make gains more economically is difficult to explain. The mineral matter and worms obtained from the soil and freedom to exercise and eat at will probably have a good effect upon digestion. Then, too, the ears of corn when husked become dry and hard, while those in the husk remain moist. Mastication in the case of the moist corn is easier; the hogs eat more and therefore gain more rapidly and economically. . . .

"During the two years' work no more corn was wasted in the field than in the yards where ear and snapped corn were fed. When young pigs are first turned into a cornfield they do not know how to find the corn, but soon learn that when a stalk is pulled down there is corn to be had. . . .

"Pigs that have plenty to eat and a big range do not root holes in the soil as is generally believed. In no case was the soil left so uneven as to make extra work necessary in preparing the land for future crops. To get the land fitted for cropping two diskings and one harrowing with the smoothing harrow is all the preparation given."

To secure data for estimating the amounts of corn fed the different lots some figures are recorded regarding shrinkage of ears husked at different times. It was found that corn husked September 20 shrank 21.5 per cent in 101 days; that husked October 10 shrank 11 per cent in 81 days, and that husked October 27 shrank 4 per cent in 64 days, and that in the early part of the season the husks represented 11 per cent of the total ear and 100 days later 6 per cent.

The authors summarize data obtained from Minnesota farmers regarding the practice of allowing hogs to gather corn and discuss various questions connected with the field management of swine, particularly the cost of fencing and related topics, and the value of corn, grain, and clover in rotation for hog pasturage.

A number of illustrations are given showing how farms may be conveniently divided for such pasture rotation.

"All that is necessary to carry out such a rotation is 3 fields of nearly uniform size, located near the farmstead. The annual cost of fencing the 3 fields would have to be charged against 2 fields (the corn and clover fields) since the fence would be of no value to the grain field. In considering the amount of hog pasture needed, and the amount of corn that can profitably be fed off, it is found that at least twice as many acres of corn can be used as of pasture. Thus, in a 3-year rotation, if the field were about the right size to furnish the pasture needed, not enough corn would be furnished. A 4-year rotation, with 1 field in grain, 1 in pasture, and 2 in corn, would furnish about the right amount of both. Four fields permanently fenced near the farmstead would make a more desirable rotation than would 3 fields, and the cost of fencing will be less since the fence would be in use 3 years out of 4 rather than 2 years out of 3. . . .

"One acre of average clover pasture will furnish ample feed for 2 sows and their litters (the average litter being about 7 pigs). Some seasons the clover will get ahead of the pigs, but clover pasture is so cheap a feed that no hog raiser can afford to run the risk of short pastures. Surplus clover in a hog pasture can be utilized for hay or other stock. A shortage of pasture necessitates supplying the deficiency by other feeds costing 2 to 4 times as much."

Investigations with swine, G. E. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 155–157*).—On the basis of data obtained with 207 hogs, part of them fed at the station and part by farmers who cooperated in the investigation, the author calculates that mixed grain returned from $20.45 to $34.13 per ton, milk 20 cts. per hundredweight, and roots 10 cts. per bushel, rating the pork at 4.5 to 6.5 cts. per pound. The average weight of the pigs when sold was 190.9 lbs. each.

"Comparing the prices obtained for feed in these experiments, with prevailing market prices for feed in ordinary years, we must admit that even if sold at 4½ cts. per pound, these hogs would return fair values for feed consumed, and at 5 cts. per pound they would return more than ordinary market prices for feed consumed.

"It is not often that hogs have sold at less than 5 cts. per pound during late years, and since the usual price for hogs has been considerably above 5 cts. per pound, we must conclude that selling farm products in the form of finished hogs is generally a profitable method of disposing of them.

"While it is a bad thing for a farmer to be overstocked with hogs, yet there is an important place for hogs upon most farms, and especially upon those farms where dairy by-products are available."

Pig-feeding tests with different quantities of skim milk and an otherwise uniform ration, J. Klein (*Deut. Landw. Presse, 34 (1907), No. 67, p. 542*).—A brief account of feeding smaller quantities of milk with and without fish meal in comparison with larger amounts showed that practically the same results were obtained with the smaller quantity as with the larger under the experimental conditions.

Beans in horse feeding, M. Rasquin (*Jour. Soc. Agr. Brabant et Hainaut, 52 (1907), No. 47, pp. 1124, 1125*).—The author gives data regarding the extensive use of beans in horse feeding and other information on this topic.

Milk in horse feeding, L. Grandeau (*Jour. Agr. Prat., n. ser., 13 (1907), No. 23, pp. 713, 714*).—The author discusses data on the composition and feeding value of dried skim milk, which he states has been found to be a satisfactory feeding stuff for horses.

Poultry work at government expense (*Rel. Poultry Jour., 13 (1906), Nos. 7, pp. 685, 701, fig. 1; 8, pp. 760–762, 782–784, figs. 6; 9, pp. 856–858, 869–871, figs. 10; 10, pp. 968–971, figs. 8; 11, pp. 1065–1067, figs. 6; 14 (1907), Nos. 5, pp. 486–488, 516, figs. 3; 7, pp. 609, 610, figs. 5*).—A series of articles by different authors summarizing data regarding the poultry work at the State and provincial agricultural colleges and experiment stations of the United States and Canada.

Poultry (*Dept. Agr. Orange River Colony Ann. Rpt., 3 (1906–7), pp. 49–51*).—An account of the poultry kept at the Tweespruit Experimental Farm, and brief notes on the gains made and the profits obtained in fattening chickens on different rations.

Making poultry pay, E. C. Powell (*New York, 1907, pp. XII+307, pl. 1, figs. 118*).—Feeding, care, and management of poultry, natural and artificial incubation, enemies, diseases, and related questions are considered in this general work on poultry feeding. There are also chapters on waterfowl, ducks, guinea hens, peafowl, pigeons, and squab raising.

Poultry experiments—a record of six hundred hens, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 115, pp. 199–210, pls. 6*).—Records were kept of the foods eaten and eggs laid in a year by 600 Single Comb White Leghorn pullets kept in a curtain front poultry house divided into compartments and fed dry mash from hoppers. On an average the hens consumed 60 lbs. per head of grain, beef scrap, and ground fresh meat and bone and about 5 lbs. of oyster shells and grit during the year, the calculated cost of the feed being 89 cts. per head.

"During the year 9 per cent of the fowls died from roup or other diseases. The fowls averaged 113 eggs each. It is possible that this somewhat low egg production could have been increased by some other system of feeding, but whether the increased egg production would have more than paid for the increased cost for labor is a question for future experiments to determine."

The highest monthly egg production was noted in March, averaging 16⅜ eggs per hen.

The authors calculate that the eggs produced during the year averaged $2.43 per hen.

[Report of] manager of poultry department, W. R. GRAHAM (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 233–236*).—The author discusses the station poultry houses, trap nests, growing chickens, and fattening chickens with special reference to the work of the department.

When 60 chickens weighing 181.5 lbs. were fattened for 3 weeks in crates a gain of 70.5 lbs. was noted. The total amount of grain consumed was 249.25 lbs. and of milk 517 lbs. The total profit was $6.72.

Tests at the east Prussian poultry school in Waldgarten on poultry feeding by the Hamburg method, WESEMANN (*Wurttemb. Wchnbl. Landw., 1907, No. 52, pp. 931, 932*).—A brief note on the substitution of other feeds for fish in a special method of winter feeding of poultry practiced in Hamburg.

Hatching and rearing chickens, W. R. GRAHAM (*Ontario Dept. Agr. Bul. 163, pp. 1–28, figs. 5*).—Experiments which have been carried on for the study of various problems connected with incubator and natural methods of hatching are discussed.

Of 958 eggs set in incubators 45.5 per cent hatched and of 335 eggs set under hens 58.5 per cent hatched. In general, the author's observations indicate that chicks hatched from hens sitting on moist earth grew best.

Moist as compared with dry incubators showed a difference of 10.9 per cent of the eggs set or 13.1 per cent of the fertile eggs in favor of the use of moisture.

Believing that carbon dioxid in the air might have an influence on incubation, whole milk, skim milk, and buttermilk inoculated with bacterial cultures which would produce carbon dioxid in quantity, were used in place of water in the moisture pans of incubators, and apparently when buttermilk was thus used the chicks had greater vigor. The same result was not noted with whole milk and "one is led to believe that the acid of the buttermilk has some action on the shell or contents, hence a chick higher in vitality is produced." When a proprietary disinfectant was used in the moisture pan the vitality was also very good, and washing the machines with a 10 per cent solution of the disinfectant the author also considers a desirable practice.

Lamp fumes in the incubators, according to the experimental data, decreased the proportion of chicks which hatched but did not decrease vitality.

Eggs put under hens for a week were removed to an incubator for hatching and eggs started in incubators were finished under hens. Where eggs were finished under hens from the nineteenth day of incubation no improvement was seen in the chickens.

"Eggs incubated one week under hens and finished by incubators gave fairly good chicks, but eggs started in incubators for a week and finished by the hen show practically no improvement over the eggs hatched for the whole period in the machine.

"This work appeared to indicate that the first portion of the hatch is a very critical time, and every care should be given at this period."

A comparison of different makes of incubators is reported and some general data are given regarding the methods of brooding, feeding, and other matters. It was found that with artificial brooding 11.8 per cent of the chickens died in 4 weeks as compared with 26.2 per cent with natural brooding.

In general, the chicks were fed on dry rations scattered at first on boards, later in straw, and then from hoppers.

The author also discusses the symptoms and possible cause of white diarrhea in chicks.

The experiments on which the author's discussion is based in considerable degree are noted below.

Humidity in relation to incubation, W. H. Day (*Ontario Dept. Agr. Bul. 163, pp. 29–50, figs. 5*).—Experiments and methods followed in the study of humidity in incubators and nests are described and experimental data reported.

With hens on earth nests the humidity as determined was 70.8 and the evaporation 9.7. With straw nests and ventilated nests the humidity was 52.8 and 35, respectively, and the evaporation 11.9 and 14.5. With buttermilk as a source of moisture in the incubator the humidity was 54.4 and the evaporation 9.5, and when a sand tray wet with water was thus used the humidity was 46.2 and the evaporation 9.6. Similar values in a dry incubator were 21.3 and 14.5 on an average.

In the author's opinion, these facts indicate that the circulation is greater in the nests than in the incubators. "Perhaps proper circulation is the vitalizing power that must be combined with those already established to place artificial incubation abreast or possibly in advance of the natural process."

Carbon dioxid in relation to incubation, C. C. Thom (*Ontario Dept. Agr. Bul. 163, pp. 51–56, fig. 1*).—As shown by the author's studies, the air under hens in nests contained on an average 31.93 volumes of carbon dioxid per 10,000 volumes of air, the highest value, 37.14, being noted in a flat nest and the lowest value, 24.08, in a ventilated nest. With incubators the values ranged from 5.86 in the case of a dry incubator treated with disinfectant to 58.21 in a dry incubator into which lamp fumes were conducted. In the incubator room the carbon dioxid content was 7.

"Although the work on carbon dioxid is not conclusive, the results so far furnish much valuable data, and establish many useful relationships. Just what function, if any, carbon dioxid performs in incubation, and to what extent it is essential, is a point on which we have not at present sufficient experimental data to warrant conclusions."

Chemical work in connection with incubation problems, R. Harcourt and H. L. Fulmer (*Ontario Dept. Agr. Bul. 163, pp. 57–66*).—Determinations were made of the percentage weight of shell, white, and yolk and the phosphoric acid and calcium oxid in each in a large number of samples of eggs. The results show a variation in weight of 44.27 to 65.28 gm. in the average eggs from different hens. On an average egg white and yolk together contained about 0.11 to 0.13 gm. phosphoric acid and about 0.03 to 0.04 gm. calcium oxid, "a very small amount to supply all the lime necessary for the formation of bone in the young chick."

Studies were also made of the lime content of eggs during different periods of incubation.

"It was soon found that after 11 days of incubation there was practically the same amount of lime in the partially developed chick as there was in the contents of the original egg, but that at the end of the incubation period there was a very decided increase."

Studies were made of the appearance of chicks at hatching with reference to the absorption of lime from the shell and analyses were made of the bodies of chicks hatched in different ways.

"While we do not wish to draw any definite conclusion on the comparatively small amount of work which has as yet been done, still we think it worthy of note that there appears to be some relation between the lime content of the chick and its vitality, as indicated by the percentage of chicks alive at the end of 4 weeks. . . .

"We are not prepared, with the insufficient data which we have at hand, to give the above hypothesis with reference to the relationship between lime content and vitality as a definite conclusion, nor to state what conditions in incubation will cause the maximum absorption of lime; but we feel that the point is worthy of further study."

DAIRY FARMING—DAIRYING—AGROTECHNY.

Milk and its relation to the public health (*Pub. Health and Mar. Hosp. Serv. U. S. Hyg. Lab. Bul. 41, pp. 757, pls. 34, figs. 9, dgms. 7*).—In the introduction to this publication, by W. Wyman (pp. 11–17) it is stated that "it has been the object to include in this volume all available data showing the influence of milk as a carrier of infection, its chemical composition, the contaminations found therein, their influence upon it as an article of food, and the measures necessary in its production and handling to prevent such contamination.

"It is evident, from a broad view of the subject, that a pure and wholesome milk supply is possible, and this volume contains all the necessary information to attain that end, as well as the existing standards of purity to which it should conform.

"The three cardinal requirements—cleanliness, cold, and speedy transportation from the cow to the consumer—must be observed, and the cow herself must be free from disease. For their observance, intelligence and care on the part of the dairyman and milk dealer are absolutely essential.

"The bearing of all these points upon the wholesomeness of milk, its treatment when contaminated, and its use as an article of food, especially for infants, has been treated in detail by the various collaborators," who contribute the series of articles of which the bulletin is composed.

Milk as a cause of epidemics of typhoid fever, scarlet fever, and diphtheria, by J. W. Trask (pp. 21–147).—An attempt is made to show how serious an indictment might be returned against milk as a carrier of diseases. A compilation of epidemics summarized from the reports of some 500 is presented and discussed in such a way as to show how disease may be spread by means of infected milk.

The milk supply of cities in relation to the epidemiology of typhoid fever, by L. L. Lumsden (pp. 151–159).—It is shown in this article how the milk supply of cities becomes contaminated with typhoid bacilli, and epidemiological methods of determining the influence of milk as a factor in the propagation of typhoid fever are considered.

The frequency of tubercle bacilli in the market milk of the city of Washington, D. C., by J. F. Anderson (pp. 163–192).—The author found "that 6.72 per cent of the samples contained tubercle bacilli virulent for guinea pigs, and that 11 per cent of the dairies whose milk was examined supplied milk containing these micro-organisms in sufficient number and virulence to render guinea pigs tuberculous. The milk purchased by one charitable institution for the use of children caused tuberculosis in the animals upon which it was tested. Evidence of this character again emphasizes the necessity of applying the tuberculin test among dairy herds, and taking necessary precautions with respect to milk of doubtful character."

The relation of goat's milk to the spread of Malta fever, by J. F. Anderson (pp. 195–208).—The author summarizes the evidence proving that Malta fever may be spread by infected goat's milk.

Milk sickness, by G. W. McCoy (pp. 211–219).—A brief review of our available knowledge regarding this peculiar disease is presented.

The relation of cow's milk to the zoo-parasitic diseases of man, by C. W. Stiles (pp. 223–225).—The author shows that so far as the zoo-parasitic diseases of man are concerned there is little to fear concerning the presence of such parasites in milk.

Morbidity and mortality statistics as influenced by milk, by J. M. Eager (pp. 229–242).—According to the figures summarized and discussed the high infant mortality may be attributed almost entirely to impure milk.

Ice cream, by H. W. Wiley (pp. 245–305).—In the discussion of this subject the author considers the use of ice cream as "an article of food, its composition, the extent to which it may be contaminated or adulterated, and the results of such contamination upon the public health. He also refers to the established standards governing its manufacture and presents evidence to show their reasonableness to the manufacturer and the consumer."

The chemistry of milk, by J. H. Kastle and N. Roberts (pp. 309–417).—The authors present "a general survey of our present knowledge regarding the physical and chemical characteristics of milk, the chemical changes in milk brought about by the action of heat and acids, and also those accomplished by the action of enzyms and micro-organisms." According to the results of investigations conducted by the authors, the milk ferments can withstand a temperature of 60 to 65° C. for some time without much real injury. Consideration is given "to the subject of milk adulteration by skimming, watering, and the addition of foreign substances, including artificial coloring matters and milk preservatives. Some attention has been paid to the effect of artificial coloring matters and preservatives on the health of man." In a general consideration of the Washington milk supply it was shown that "12 per cent of the samples examined were found to be below the legal standard, 3.7 per cent gave evidence of having been watered, and a very large proportion of the samples contained appreciable quantities of dirt. None of them contained artificial coloring matters, and only one contained milk preservatives."

The number of bacteria in milk and the value of bacterial counts, by M. J. Rosenau (pp. 421–445).—The author presents the results of bacteriological examinations of milk in many cities and points out the advantages of bacterial counts to the health officer and the practical dairyman.

The germicidal property of milk, by M. J. Rosenau and G. W. McCoy (pp. 449–476).—This article has also appeared in *Journal of Medical Research*, 18 (1908), No. 1, pp. 165–202.

"Judged by the number of colonies that develop upon agar plates, the bacteria in milk first diminish then increase in number. This so-called germicidal property of milk occurs only in the fresh raw fluid.

"For the most part our work plainly shows that no actual reduction in the number of bacteria occurs. However, when compared with the controls a restraining action is evident. The phenomenon therefore appears to resemble that of a weak antiseptic rather than that of a true germicide.

"The 'germicidal' action of milk varies in different animals and in the milk from the same animal at different times. At most the action is variable and feeble. It can not take the place of cleanliness and ice, but may be taken advantage of in good dairy methods."

The significance of leucocytes and streptococci in milk, by W. W. Miller (pp. 479–486).—The author reviews the work of a considerable number of investigators regarding the presence of leucocytes and streptococci in milk, and concludes that our present knowledge concerning their sanitary significance is very unsatisfactory.

Conditions and diseases of the cow injuriously affecting the milk, by J. R. Mohler (pp. 489–507).—According to the information summarized by the author probably the most important disease of cows, from the standpoint of public health, is tuberculosis, which is also the most prevalent. The great practical value of the tuberculin test is pointed out and it is insisted that all milk should either come from tuberculin-tested cattle or be subjected to pasteurization under supervision of competent authorities.

Sanitary inspection and its bearing on clean milk, by E. H. Webster (pp. 511–523).—Very significant features of clean and unclean dairying are shown by numerous illustrations. The value of the score card in the sanitary inspection of dairies and its bearing on the production of clean milk are emphasized and 21 useful suggestions concerning the cows, stables, milk houses, and methods of milking and handling milk are given.

Sanitary water supplies for dairy farms, by B. M. Bolton (pp. 527–539).—Information is given regarding the requirements of sanitary water supplies, the sources of water on dairy farms, sources of pollution and methods of prevention.

Methods and results of the examination of water supplies of dairies supplying the District of Columbia, by B. M. Bolton (pp. 543–556).—According to the results of an examination of water supplies very few were free from sanitary objection, but in many or most cases the faults could be remedied with little expense.

The classification of market milk, by A. D. Melvin (pp. 559–561).—The author suggests that market milk be classified as (1) certified milk, (2) inspected milk, and (3) pasteurized milk, and explains the distinction between the classes.

Certified milk and infants' milk depots, by J. W. Kerr (pp. 565–588).—A brief outline of the organization and management of milk commissions in the United States, established to encourage the production of certified milk.

Pasteurization, by M. J. Rosenau (pp. 591–628).—The author discusses both the advantages and disadvantages of pasteurization. He recommends that milk be pasteurized at 60° for 20 minutes, as this temperature is sufficient to destroy the pathogenic organisms without otherwise materially altering the character of the milk. In his opinion, in large communities at least, pasteurization should be carried out under the supervision of health authorities.

Infant feeding, by J. W. Schereschewsky (pp. 631–676).—The present knowledge regarding this subject is summarized and discussed.

The municipal regulation of the milk supply of the District of Columbia, by W. C. Woodward (pp. 679–747).—The author gives "the history of the development of the milk inspection service, which consists of supervision, inspection of dairies and dairy farms, and inspection of the milk. It is shown that these measures have resulted in the improvement of the milk supply, and that there has been a notable reduction of morbidity following their inauguration.

"The laws and ordinances governing the supervision of milk are given, and in addition copies of the forms of reports, etc., which are of value to those having supervision of milk supplies."

Investigation in milk production. The relation of nutriment to product, T. L. Haecker (*Minnesota Sta. Bul. 106, pp. 147–169, figs. 5*).—The records of the cows participating in the dairy cow demonstration at the World's Fair in St. Louis in 1904 are summarized and discussed in such a way as to show the relation between nutriment and product. According to the data summarized the cows consumed an enormous amount of feed, nearly twice the amount given in ordinary feeding. The Swiss and Holstein cows received a large amount of green forage, and the Jersey cows a large quantity of alfalfa hay. The Shorthorns received considerable lighter rations than either of the other groups.

From a comparison of the daily average consumption of nutriment and the production of milk and butter fat with standards showing the daily average nutriment required for maintenance, gain in weight, and production, it appears that the Swiss cows received 5.889 lbs., the Holsteins 3.688 lbs., the Jerseys 2.121 lbs., and the Shorthorns 0.725 lb. more nutriment per day than was actually assimilated. Summarizing the results for the different breeds with respect to quantity of nutriment required to produce milk and milk solids shows that the Jersey cows required 12.051 lbs., the Holsteins 14.839 lbs., the Shorthorns 15.520 lbs., and the Swiss 16.919 lbs. of nutriment for the production of 1 lb. of butter fat. For the production of milk solids the order was the same. "The breed that comes nearest to the true dairy type produces dairy products with the smallest amount of nutriment, and the farther they deviate from this type the more nutriment is required for the production of a unit of dairy product."

In the author's opinion "the results of this competitive test show that type is the most important point in determining the adaptability of a cow to economical dairy work."

[Record of] the dairy herd, G. E. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 162–164*).—The records of 16 cows of the dairy herd for 1 year are given. These ranged for the different individuals from 10,064 to 5,263 lbs. of milk, and the profit over the cost of feeding ranged from $109.76 to $17.44.

Report of the professor of dairy husbandry, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 97–130*).—Experiments on butter making and cheese making, and studies of methods of determining moisture in dairy products were conducted in continuation of previous work (E. S. R., 19, p. 73).

The method of determining moisture in dairy products by drying samples in small tin pans in a steam oven was again studied and further recommended. The Gray method and the Richmond method were tested in comparison with it and were found not altogether satisfactory.

The experiments in butter making were like those of previous years. According to the results obtained "the advisability of pasteurizing sour cream for export butter would appear doubtful." The highest average total score was given for butter made from sweet cream pasteurized, cooled, and having culture added before being churned at once after cooling, although the highest average score for flavor was given for butter made from cream partly sweet and partly sour when pasteurized, ripened in the usual way, and churned the following day. The lowest average total scores were those for butter made from pasteurized sour cream churned the day after pasteurization and from cream pasteurized sour and churned at once with and without culture added before churning. The loss of fat in buttermilk from churning pasteurized sour cream was excessive. The butter made without salt was given preference in London. The quality of butter with borax added at the rate of 0.25 per cent was not much different from that with more expensive preservatives.

From a study of the effects of various methods of churning and other factors on the percentage of moisture in the butter the conclusions drawn were in accord with those from previous work. "In order to be effective these abnormal methods have to be carried to a point where the tendency is to produce a greasy, gritty, mottled butter. The flavor of the butter does not appear to have been affected very much by the various methods adopted."

In a study of the pasteurization of milk for cheese making the average percentage of fat in the whey from the pasteurized milk was larger than that from the normal milk, but the yield of cheese was about 14 lbs. per 1,000 lbs. of milk larger from the former than from the latter. The cheese made from the pasteurized milk shrank 4.5 per cent in 1 month as compared with 3.7 per cent for cheese from normal milk. The average score for the former was 88 as compared with 89.97 for the latter. The results were considered not very satisfactory.

In a study of methods of cutting curd from overripe milk, less loss of fat in the whey and an increased yield of cheese amounting to nearly 1 lb. of cured cheese per 1,000 lbs. of milk resulted from the use of a knife made of fine wire (30 gage) and having the wires ¼ in. apart, and cutting the curd only twice, as compared with results obtained with the regular form of curd knife, with the wires ⅜ in. apart, and cutting the curd five to seven times. A wire curd knife was found superior to the ordinary steel blade knife for cutting curds to be made into Cheddar cheese. The results of experiments regarding moisture in curd were similar to those obtained in corresponding experiments of previous years. With a difference of over 5 per cent in moisture content in the curds there was but 0.5 per cent difference in that of green cheese, and the acid developed somewhat faster in the curds which were more moist after dipping. According to these experiments the energy expended in stirring curds might be saved as the curds will, if properly handled, drain sufficiently of themselves and an increased yield of cheese will result. A further study was made of the loss from ripening curds too much before salting. There was a gain of over 1.5 lbs. of cheese per 1,000 lbs. of milk by salting at about 3 hours instead of about 5 hours after dipping, but the shrinkage was somewhat greater from the cheese salted earlier. There was apparently very little difference in the quality of the cheese made from curds salted at different stages of acidity.

The bitterness of milk and cheese, TRAILLAT and SAUTON (*Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 3, pp. 162–166*).—The relation between the bitterness of milk due to the action of micro-organisms and the presence of acetic aldehyde and ammoniacal salts is considered. See also previous work (E. S. R., 18, p. 873; 19, p. 76).

In the experiments here summarized sterile milk became bitter when inoculated simultaneously with organisms that produced aldehyde and those that produced ammonia, but not when either kind was used alone. The conditions under which bitterness was produced may occur naturally from accidental inoculation.

A bitter fermentation of cheese, C. H. ECKLES (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 8–9, pp. 229–234*).—The cause of the bitter taste occasionally occurring in cheese made at the dairy department of the Missouri Station was found to be a liquefying organism, designated as B. 112, the characteristics of which are described. This organism was also found in samples of bitter cheese obtained from other sources.

Chloroform as an aid in the study of milk enzyms, H. A. HARDING and L. L. VAN SLYKE (*New York State Sta. Tech. Bul. 6, pp. 40–82*).—The data reported in this bulletin were accumulated by the authors during the progress of investigations at the station on the curing of cheese and more especially in studies of the relation of milk enzyms to cheese ripening. One essential in such study is some means of repressing the lower forms of life that attack digesting solutions. For this purpose the investigators used chloroform, and in this publication report the results of their efforts to determine the action of this reagent with respect to its germicidal properties and its effect upon the enzym and upon the proteids. They summarize the data as follows:

"Solubility.—At 20° C. (68° F.) skim milk is saturated by 0.55 per cent of chloroform by volume. Normal milk containing 5 per cent of fat requires an additional 1 per cent of chloroform to produce saturation.

"Germicidal action.—Skim milk containing 3 per cent of protein requires 0.2 per cent by volume of chloroform to destroy the vegetative bacteria gradually and 0.4 per cent to destroy them within 24 hours. In normal milk containing 5 per cent of fat, 1 per cent of chloroform destroys the vegetative forms gradually, 1.5 per cent destroys them within 24 hours, while 2 per cent accomplishes this result within 4 hours. The spores are not immediately destroyed even with excessive amounts of chloroform.

"In chloroformed cheese the germicidal action is slightly variable and a uniform destruction of the vegetative forms was not obtained with less than 10 per cent by weight of chloroform.

"Action on milk enzyms.—In skim milk, digestion progressed at a uniform rate in the presence of chloroform varying from 0.2 to 0.7 per cent by volume. With increasing percentages of chloroform there was a decrease in the rate of digestion, which in the presence of 2.5 per cent of chloroform amounted to 12 per cent of that occurring in the presence of 0.7 per cent of chloroform. Increasing the percentage of chloroform from 2.5 to 30 per cent did not retard the rate of digestion much more than did 2.5 per cent.

"Action on milk proteids.—Chloroform above the amounts required to saturate the milk settles to the bottom carrying down a portion of the casein. This is observable as a white, opaque layer."

Their general conclusion from this work is that "chloroform is a fairly satisfactory agent for repressing germ life in connection with the study of milk enzyms. Quantitative studies of the action of such enzyms should receive a correction of at least 10 per cent where 2.5 per cent of chloroform or more is used."

VETERINARY MEDICINE.

The disinfectant action of light upon pathogenic bacteria, E. Neumark (*Inaug. Diss. Univ. Giessen, 1907, pp. 76, pl. 1*).—The effect of direct and diffuse sunlight was tested upon a number of bacteria. It was found that in direct sunlight anthrax spores are killed in 25 to 30 minutes, anthrax bacilli in 20 to 25 minutes, coli bacilli in 60 minutes, hog-cholera bacilli in 2 hours, the bacilli of fowl cholera in 8 to 10 minutes, and the bacilli of swine plague in the same length of time. These tests were made with bacteria on agar plates. Diffuse sunlight required a much longer time for the manifestation of disinfectant action upon bacteria. The organism of swine erysipelas in water was not destroyed by direct sunlight after an exposure of 8 hours.

It is apparent from these results that direct sunlight possesses a powerful disinfectant action. The susceptibility of different bacteria to sunlight varies greatly, but the results show that it is of great importance in disinfection after the occurrence of contagious diseases. In the author's opinion, light exercises a direct effect upon the bacteria rather than an indirect effect upon the nutrient media. Electric light is much less effective than sunlight.

Results of investigations in the field of general pathology and pathological anatomy of man and animals, O. Lubarsch and R. Ostertag (*Ergeb. Allg. Path. Mensch. u. Tiere, 11 (1907), pt. 2, pp. XI+1224*).—In this volume an elaborate review is given of literature relating to the pathology of the nervous system, reproductive organs, circulatory system, and bones, particularly to Russian and Polish literature along these lines. The other subjects discussed in the volume include the formation of glycogen, thrombosis, tumors, and cellular pathology.

Annual report on investigations in the field of veterinary medicine, Ellenberger and Schütz (*Jahresber. Vet. Med., 26 (1906), pp. VIII+433*).—As in previous reports of this series, a review is given of the more important results announced during the year in the field of veterinary science. The subject-matter is arranged under 20 general headings classified according to the nature of the work.

Report on the operations of the veterinary sanitary service of Paris and the department of the Seine for the year 1906, H. Martel (*Rapport sur les Opérations du Service Vétérinaire Sanitaire de Paris et du Département de la Seine pendant l'Année 1906. Paris, 1907, pp. 171*).—The veterinary service has had the subject of rabies under constant attention and this disease is disappearing. Glanders is rapidly diminishing in importance on account of the stringent rules which have been adopted for its control. All horses which show even the slightest evidence of glanders are slaughtered. The distribution of tuberculosis remains stationary for the reason that the methods thus far adopted in the control of this disease are ineffectual. It is stated that the sanitary condition of meats in the abattoirs and markets of Paris has improved by reason of the careful inspection of these products.

A large part of the report is occupied with tabular data concerning the prevalence of various infectious diseases, the inspection of live animals, milk inspection, and veterinary police regulations.

Report of the royal veterinary high school at Dresden, 1906, W. Ellenberger et al. (*Ber. K. Tierärztl. Hochschule Dresden, n. ser., 1 (1906), pp. 222, pls. 4, fig. 1*).—The larger part of this report is occupied with special reports by members of the faculty on anatomical, physiological, chemical, physical, surgical, medical, and sanitary work and investigations in animal breeding. In the pathological work of the year special mention is made of cases of actinomycosis of the esophagus in cattle, primary tuberculosis of the tongue in calves, and multiple tuberculosis of the subcutaneous connective tissue in cattle.

During the year under report considerable experience was had in the diagnosis of rabies and in agglutination and mallein tests for glanders. Neither of these tests for glanders failed in a single instance. It was found possible to immunize cattle against tuberculosis by means of injections of attenuated and dead human tubercle bacilli. So long as the duration of the immunity thus produced is not known it is recommended that the vaccination be repeated annually.

Notes from practice, G. Friedrich (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 46, pp. 901–905*).—An outbreak of dysentery among calves was in no way checked by the application of antiseptics to the umbilicus. The use of a polyvalent serum, however, offered complete protection.

Notes are given on a case of tetanus in a cow as a result of a puncture of the stomach wall by a foreign body from the inside and on a case of air emboly following upon parturition in a cow.

The veterinary section, R. W. Jackson, R. Moore, and R. H. Williams (*Transvaal Agr. Jour., 5 (1907), No. 20, pp. 914–924*).—A copy is given of a paper published in 1881 regarding the status of horse sickness in the Transvaal at that time. The disease prevailed extensively but the remedies employed were not calculated to restrict it.

At the present time there are 171 outbreaks of East Coast fever in Natal. Brief statements are given regarding the occurrence of this disease.

Annual report on the distribution of animal plagues in the German Empire (*Jahresber. Verbr. Tierseuch. Deut. Reiche, 21 (1906), pp. VI+395, maps 4*).—From the official reports received by the Imperial Health Office a general statement is presented regarding the prevalence in the German Empire of anthrax, blackleg, rabies, glanders, foot-and-mouth disease, pleuro-pneumonia, sheep pox, sheep scab, swine plague, hog cholera, fowl cholera, tuberculosis, etc. A large part of the report is occupied with tables showing the distribution of these diseases in detail. Copies are also given of various quarantine regulations against different foreign countries.

Sodium cinnamate and leucocytosis in anthrax in rabbits, G. Boehm (*Arch. Hyg., 62 (1907), No. 4, pp. 343–364*).—The intravenous or subcutaneous injection of sodium cinnamate in rabbits causes a pronounced hyperleucocytosis, but their resistance to anthrax is only slightly increased by artificially increasing the number of leucocytes. The blood of rabbits at the height of leucocytosis possesses no bactericidal power and the number of blood plaques is not diminished.

The prolongation of the period of incubation of rabies under various conditions, C. Fermi (*Arch. Farmacol. Sper. e Sci. Aff., 6 (1907), No. 11, pp. 587–593*).—As a result of dilution of rabies virus to the extent of 10,000 to 60,000 times, the period of incubation in inoculated animals was extended from 3 to 22 days. Similarly after filtration of the virus the period of incubation was extended from 2 to 12 days. When rabies virus was previously treated with potassium permanganate, carbonate of soda, iodin, and other substances, the symptoms of rabies appeared 2 days later than in the control animals.

Treatment of tetanus with Behring's antitoxin in veterinary medicine, A. Schotte (*Inaug. Diss. Univ. Bern, 1907, pp. 163*).—The literature relating to cases of tetanus which have been treated by the antitoxic method is carefully summarized and results presented in a tabular form to show the clinical history of each case. Three cases of tetanus in horses were treated by the author with antitoxin with the result that two died and one recovered after repeated injections. Judging by the results thus far obtained by the author and other investigators, the antitoxic treatment of tetanus in animals appears to be a somewhat tedious and expensive method.

Treatment of trypanosomiases, A. Laveran and A. Thiroux (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 19, pp. 739–742*).—During the past few years many experiments have been made in the use of various forms of arsenical compounds in the treatment of diseases caused by trypanosomes. Some favorable results have been obtained from the use of atoxyl, but in many cases this drug has led to disappointment. In the experiments of the authors, which were largely conducted on guinea pigs infected with surra, results were obtained which indicate that it may be desirable to use both atoxyl and arsenic trisulphid.

Treatment of dourine, W. L. Yakimoff (*Centbl. Bakt. [etc.], 1. Abt., Orig., 45 (1907), No. 5, pp. 437–450*).—Trypanrot, in experiments carried on by the author, was found to be a specific against the trypanosome of dourine. In mice 0.5 cc. of a 1 per cent solution of trypanrot caused the complete disappearance of the trypanosomes from the blood after they had been demonstrable in the blood for a period of 4 or 5 days. In order to prevent the recurrence of the disease it is necessary to repeat the injections with trypanrot at frequent intervals. As a curative agent for dourine trypanrot appears to be of high value. It has, however, little protective power and may exert a toxic influence. This has been shown to be the case in guinea pigs.

Dourine and a few conditions simulating it, E. T. Davison (*Amer. Vet. Rev., 32 (1907), No. 1, pp. 44–49*).—The etiology of dourine is briefly discussed. Attention is called to the fact that a great variety of pathological conditions may cause the disappearance of pigment similar to that observed in dourine. This may occur as a result of chafing, alkali dust, sun scald, vesicular eruption, bursatti, etc. It is also frequently noted in cases of so-called pinto horses.

The author believes that many other pathological conditions have been mistaken for dourine.

A contribution to the study of the relationship between avian and human tuberculosis, S. G. SHATTOCK ET AL. (*Lancet [London], 1907, II, No. 21, pp. 1443-1445*).—In a series of experiments carried on by the authors, the human tubercle bacillus was found to be pathogenic for pigeons to only a very limited degree. No general infection was set up, but merely a local reaction sometimes affecting the nearest glands. The avian tubercle bacillus as obtained from various species of birds proved likewise to be only slightly pathogenic for guinea pigs. No transformation was observed in the human tubercle bacillus by inoculation into birds, and the results of feeding and inoculation experiments indicate quite clearly that the human and avian tubercle bacilli are distinct forms. Little reliance is placed on the opsonic test, for the reason that it has been found that opsonin may be extracted from tuberculous serum by saturating it with a thick suspension of melanin.

Relationship between tubercle bacillus and other acid-fast bacilli, L. PANISSET (*Rev. Gén. Méd. Vét., 10 (1907), No. 118, pp. 533-537*).—Numerous authors have called attention to the resemblance between the tubercle bacillus and other related organisms with waxy or fatty membrane. In the experiments reported by the author of this paper cultures of the grass bacillus and timothy bacillus were suspended in collodion sacs in the peritoneum of rabbits. The cultures were placed in new sacs and introduced into other rabbits from time to time in order to facilitate the interaction of the bacilli and the fluids of the rabbit body. No indication was obtained of any tendency on the part of the bacilli to become pathogenic.

Skin and eye reaction to tuberculin in cattle, M. VANDERHEYDEN (*Ann. Méd. Vét., 56 (1907), No. 11, pp. 611-616*).—These two methods for obtaining a reaction to tuberculin were tested on healthy and tuberculous cattle with the result that the methods appeared to have no practical value in the diagnosis of tuberculosis.

The diagnosis of tuberculosis in cattle by the simultaneous use of the eye-and-skin reaction to tuberculin, J. LIGNIÈRES (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 22, pp. 948-950*).—During the author's experiments the simultaneous application of tuberculin to the skin and eye was made on more than 200 cattle. In every case where a positive reaction was obtained from applying the tuberculin merely to the skin, the combination eye-and-skin test was also positive. All cattle which subsequently proved to be nontuberculous gave negative reactions.

Ophthalmo-reaction in cattle, MOREL (*Hyg. Viande et Lait, 1 (1907), No. 11, pp. 493-507*).—Clinical notes are given on the results of a long series of tests of the ophthalmic reaction to tuberculin in cattle. The author obtained good results with this test and believes that it may be serviceable in cases where the hypodermic application of tuberculin could not be made. In every case of reaction in which post-mortem examination was subsequently made the indications of the test were confirmed.

The skin reaction to tuberculin, J. LIGNIÈRES (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 18, pp. 727-729*).—In the opinion of the author distinction should be made between cuti-reaction in which tuberculin is simply rubbed upon the uninjured skin and dermal reaction in which the skin is somewhat scarified. It is maintained that cuti-reaction will give positive results if repeated at intervals no longer than 24 hours. From 4 to 6 drops of tuberculin may be rubbed upon the skin with a cotton tampon. After such treatment the reaction is entirely local but easily recognized. There is no organic reaction or appreciable elevation of temperature.

Cuti-reaction to tuberculin in experiments with calves and dogs, F. Arloing (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 34, pp. 499–501*).—In experiments with calves and dogs known to be tuberculous, the cuti-reaction failed to occur in a large percentage of cases and this method is, therefore, considered unreliable.

Memorandum on inquiries made in 1905–6 with respect to pig tuberculosis, and administration in London in regard to meat of tuberculous pigs, G. S. Buchanan (*Ann. Rpt. Local Govt. Bd. [Gt. Brit.], 35 (1905–6), pp. 21–24*).—According to the author, the conditions of the meat trade at the Smithfield central meat market are such that systematic examination of all hog carcasses is impossible. It is admitted, therefore, that tuberculosis pork may be sold in this market without the fact being ascertained by meat inspectors. The chief defect of the present system of inspection consists in the fact that inspection is made on the dressed carcass and not upon the whole animal at the time of slaughtering. The present requirements of the Royal Commission regarding tuberculosis in pork are that all carcasses in which the disease is recognized shall be condemned.

Echinococcosis in the domesticated animals, M. A. Martin (*Jour. Compar. Path. and Ther., 20 (1907), No. 4, pp. 305–324*).—The literature relating to echinococcosis in domestic animals is quite extensive. In the present article the author has undertaken a general review of the subject with especial reference to recent additions to our knowledge of the disease.

Foot-and-mouth disease, R. Marra (*Rev. Gén. Méd. Vét., 11 (1908), No. 122, pp. 49–57*).—The means by which foot-and-mouth disease is carried from one animal to another are discussed in some detail. Although it is commonly stated that recovery from an attack of foot-and-mouth disease confers an immunity which exists for 4 to 8 months, in the author's experience, on the other hand, no such immunity seemed to arise. Animals which had just recovered from foot-and-mouth disease were more susceptible than those which had never been affected.

A form of enzootic mammitis in cows, P. Stazzi (*Clin. Vet. [Milan], Sez. Sci., 30 (1907), No. 5, pp. 191–208, pl. 1*).—Detailed clinical notes are given on the symptoms and course of a form of mammitis in cows. The author states that in his experience mammitis caused by streptococcus is of a chronic, catarrhal, or purulent form, and that caused by staphylococcus or micrococcus is usually catarrhal but may become acute and parenchymatous. The ordinary epizootic form of mammitis is due to *Bacillus mastiditis contagiosæ*.

Milk fever in cows, H. Thompson (*Vet. Rec., 20 (1907), No. 1009, pp. 329–331*).—Attention is called to an article published by the author in 1877 in which it was maintained that the cause of milk fever was to be sought in some disturbance of the milk secretion in the udder. The author is of the opinion that by means of bandages properly applied to the udder a pressure might be brought about which would give the same results as distention with air or liquid.

Verminous bronchitis in cattle and means of combating it, A. Scheibel (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 48, pp. 673–677, fig. 1*).—The symptoms and pathological anatomy of verminous bronchitis are described in detail with particular reference to the differential diagnosis between this disease and tuberculosis. The best results in the treatment of the disease have been obtained from applying in the trachea a spray containing creosote, alcohol, and water.

Parasites of cattle and sheep, J. Penberthy (*Jour. Roy. Agr. Soc. England, 67 (1906), pp. 64–97, figs. 14*).—Economic and biological notes are given on warble flies, cattle lice, mange mites, ticks, ringworm fungus, stomach worms, lungworms, flukes, tapeworms, sheep tick, sheep botfly, parasite bronchitis, etc.

Gangrenous mammitis in sheep maintained from milk, J. Bridré (*Bul. Soc. Cent. Méd. Vét., 84* (*1907*), *No. 22, pp. 500–505*).—The etiology and pathology of this disease are briefly discussed. Among the various remedies which have been tried for controlling it none has given results so satisfactory as those obtained by vaccination. The vaccine used by the author was prepared by attenuating pure cultures of the organism of the disease for several weeks at a temperature of 37° C. In order to avoid abortion as a result of vaccination, the author recommends that animals should be vaccinated during the first 2 months of gestation. The use of the method recommended by him has resulted in reducing the disease about 70 per cent.

A method for combating sheep pox, D. Konew (*Centbl. Bakt.* [*etc.*], *1. Abt., Ref., 40* (*1907*), *No. 11–12, pp. 337–339*).—The reaction obtained in rabbits by inoculating them with sheep-pox virus was not sufficient to obtain a vaccine, and goats were then used for this purpose. It was found that after sheep-pox virus had been passed through goats 15 times a vaccine was obtained which was very efficient in protecting sheep against the disease. This vaccine was tested in 117 localities on nearly 92,000 sheep with excellent results.

The occurrence of pathogenic micro-organisms in healthy swine, P. A. Van Velzen (*Inaug. Diss. Univ. Bern, 1907, pp. 96*).—Historical and critical notes are given on the literature relating to the finding of virulent pathogenic bacteria in the organs of healthy swine. The author made a long series of observations on this subject with particular reference to the more important species of bacteria which affect swine. The bacilli of swine erysipelas were less frequently found in healthy swine than has usually been reported by other investigators. Tubercle bacilli were not found in healthy animals. On the other hand, the bacilli of necrosis and pseudotuberculosis as well as *Bacillus enteritidis* were quite frequently obtained from the organs of apparently healthy swine.

A discussion of Uhlenhuth's investigations on the etiology of hog cholera, A. Stadie (*Berlin. Tierärztl. Wchnschr., 1907, No. 45, pp. 799, 800*).—It is considered as demonstrated that hog cholera in Germany is caused by filterable virus. The work thus far done in perfecting a vaccine is briefly reviewed. Good results have been obtained by a number of investigators in the use of an active hog-cholera serum. Credit is given to the Bureau of Animal Industry of this Department for priority along this line. The method, however, is considered too elaborate and expensive. Further investigations are, therefore, desirable for the purpose of simplifying the vaccination methods.

The effect sometimes produced by feeding immature, unsound, and mouldy corn to equines, L. C. Tiffany (*Amer. Vet. Rev., 30* (*1907*), *No. 12, pp. 1425–1430*).—Clinical notes are given on a number of serious or fatal cases of poisoning in horses from eating unsound or moldy corn. These symptoms were usually those of meningitis and the lesions found upon post-mortem examination resembled those of this disease. No medicinal treatment has proved satisfactory.

A nasal ulcer resembling glanders in the horse, L. Cominotti (*Clin. Vet.* [*Milan*], *Sez. Prat., 30* (*1907*), *No. 30, pp. 485–491, fig. 1*).—The literature relating to nasal ulcerations in horses is briefly reviewed. A detailed description is given of a case observed by the author which appeared to be due to *Saccharomyces equi*.

The histological lesions of experimental glanders, C. W. Duval and P. G. White (*Trans. Assoc. Amer. Physicians, 22* (*1907*), *pp. 398–428, pls. 4*).—Conflicting observations had left it uncertain whether the histological changes in experimental glanders vary with the virulence of the glanders bacillus. In order to determine this point the author carried out a series of experiments on rabbits and guinea pigs.

It was found that the glanders bacillus may be so modified in virulence as to produce lesions widely different in their histological features. The most virulent cultures produce primary necrosis of the tissue followed by an invasion of polymorphonuclear leucocytes. Glanders bacilli of moderate virulence give a primary lesion of an acute inflammatory nature without necrosis. Attenuated bacilli produce proliferation with the formation of giant cells. Numerous gradations occur between the lesions of acute exudative and chronic proliferative glanders. The glanderous lesion is always focal in character.

A simplified method of diagnosing glanders by agglutination, W. E. King and E. M. Houghton (*Amer. Vet. Rev., 31 (1907), No. 2, pp. 178–190, figs. 2*).—In the opinion of the authors, the chief advantages of the agglutination method for diagnosing glanders are its reliability, convenience, and the possibility of using it for confirming diagnosis after the death of the animal. The apparatus necessary for carrying on the test is described and various details connected with the laboratory work are discussed. If four agglutination tubes are used and negative results are obtained in all these tubes, this may be considered as positive proof that the animal is not affected with glanders. Similarly if a reaction is obtained only in a tube in which the serum is diluted 200 times, the diagnosis of glanders is not indicated. If agglutination takes place at dilutions of 200 and 500 but not at 800 and 1,200, the case may be considered doubtful.

Skin and eye reaction to mallein, A. Putzeys and T. Stiennon (*Ann. Méd. Vét., 56 (1907), No. 11, pp. 616–619*).—A test was made of these methods of obtaining a reaction in glandered horses. For this purpose the authors experimented with 2 horses and came to the conclusion that the skin and eye reaction to mallein is of no practical importance for the reason that it is too inconstant.

Interpretation of the reaction to mallein, R. Racca (*Clin. Vet. [Milan], Sez. Prat., 30 (1907), Nos. 32, pp. 517–526; 33, pp. 540–542; 34, pp. 554–558; 35, pp. 570–573; 36, pp. 585–590; 37, pp. 598–603*).—A critical review is presented of the literature relating to the use of mallein with particular reference to the interpretation of the reaction of glandered horses.

The horse: Its treatment in health and disease, edited by J. W. Axe (*London [1907], Vol. 8, pp. XII+189–412, pls. 14, figs. 94*).—In this, the eighth volume of the general treatise on the horse, prepared under the author's direction, breeding, training, stables, examination of horses as to soundness, and related topics are taken up.

The pathological changes in the eggs and oviducts of birds, S. P. von Durski (*Inaug. Diss. Univ. Bern, 1907, pp. 35, pls. 3*).—Descriptions are given of the anatomical characters of various sorts of abnormal eggs. The pathological anatomy and physiology of the oviducts are also discussed with particular reference to the connection between these pathological conditions and the production of abnormal eggs.

The histology of fowl plague, J. Schiffmann (*Centbl. Bakt. [etc.], 1. Abt., Orig., 45 (1907), No. 5, pp. 393–403, pl. 1*).—A number of inoculation experiments with the virus of fowl plague were made, particularly in geese. In the cerebrum of artificially inoculated geese certain corpuscles were found which in some respects resembled Negri bodies, but could be distinguished from them by the fact that the Negri bodies may occur in large numbers in a single cell, while the corpuscles of fowl plague occur singly in each cell. These specific bodies were found only in inoculated birds and never in healthy geese. Necrotic areas were also noted as the characteristic lesions of the disease.

Epithelioma contagiosum, A. T. Kinsley (*Amer. Vet. Rev., 30 (1907), No. 12, pp. 1438–1443, figs. 4*).—Notes are given on the occurrence of this disease and on the pathological histology observed in the characteristic lesions. It is difficult to differentiate between this disease and roup and the two may be identical. Good results are reported in treating the disease by the use of solutions of creolin, phenol, etc.

Leukemia in fowls, J. Kon (*Arch. Path. Anat. u. Physiol. [Virchow], 190 (1907), No. 2, pp. 338-349*).—Cases previously reported as leukemia in fowls are believed by the author to have been examples of leucocytosis. During the progress of experiments on fowls in the study of diseases and other matters one case of true leukemia was observed, the gross and microscopic pathology of which is described in detail. The chief histological changes consisted in a cellular hyperplasia of the bone marrow and spleen and cellular infiltration of the other organs. The infiltration was particularly marked in the liver. The ratio of leucocytes to red corpuscles was 1 : 2. The relative occurrence of the different kinds of leucocytes was as follows: Large mononuclear cells 70.7 per cent, small lymphocytes 22 per cent, eosinophilous cells 6.3, and masked cells 1.2. The spleen is considered as an important source of the leucocytes in this disease.

The common-sense poultry doctor, J. H. Robinson (*Boston, Mass., 1907, pp. 176*).—Chapters are given on the relationship of cleanliness and sanitation to the general health of poultry and the symptoms of disease. The larger part of the volume is occupied with practical notes on the occurrence, symptoms, and treatment of the more important diseases which affect poultry.

Introduction to the official inspection of fowls, O. Graffunder (*Anleitung zur amtstierärztlichen Untersuchung des Geflugels. Berlin, 1907, pp. III+111*).—The production of poultry in Germany is quite insufficient for national consumption, and the author has, therefore, undertaken the preparation of the present pamphlet as an encouragement to the poultry industry. It contains information on the nature and means of distribution of the most important poultry diseases, including fowl cholera, fowl plague, roup, tuberculosis, and various other diseases of less importance, with particular attention to the methods of inspection of living and dressed fowls in the detection of various diseases. Copies are given of the German laws relating to fowl diseases, which provide for compulsory notification in case of outbreaks of fowl cholera or fowl plague, but not for other fowl diseases.

Our slaughterhouse system. The German abattoir, C. Cash and H. Heiss (*London, 1907, pp. XII+212, figs. 58*).—An outline is given of the conditions which prevail in the slaughterhouses in England. In almost all instances these slaughterhouses are private concerns and in some cities their number is as high as from 50 to over 400. It is stated that the materials used in the construction of these slaughterhouses are not well adapted to the purpose, that the buildings themselves are located in the immediate vicinity of dwelling houses, stables, and other structures, and that their sanitary condition in the majority of cases is very unsatisfactory. On account of the excessively large number and irregular distribution of slaughterhouses in different cities, it is impossible to carry on an effective system of meat inspection.

An appeal is made for the establishment of public abattoirs. As examples of what may be accomplished in this direction mention is made of a number of public abattoirs in German cities, with descriptions of the conditions which prevail in these institutions.

RURAL ENGINEERING.

Irrigation investigations, G. E. P. Smith (*Arizona Sta. Rpt. 1907, pp. 237-244, fig. 1*).—This is a brief account of the principal investigations undertaken by the irrigation engineer of the station during the year, including especially observations on the underflow of certain Arizona rivers, more particularly the

Rillito, the gaging of Santa Cruz River, pumping water for irrigation, and the manufacture of cement pipe for small irrigating systems (E. S. R., 19, p. 689). The observations which have been made on underflow indicate that a considerable supply of water can be made available from this source. It is reported that numerous pumping plants have been installed during the last two years, "and it is becoming very apparent that a well arranged pumping plant, combined with judicious and energetic farming, is an excellent investment."

The prevention of injury by floods in the Neosho Valley, Kansas, J. O. Wright and C. G. Elliott (*U. S. Dept. Agr., Office Expt. Stas. Bul. 198, pp. 44, pls. 14, figs. 3*).—Since 1892 attempts have been made to protect from floods the land in Neosho County by the building of levees, but though these have afforded protection ordinarily, they have been found inadequate during such floods as the one which occurred in 1904, and which is estimated to have damaged property to the extent of $1,200,000. In response to requests from residents of the valley for information as to the best methods of obtaining relief from such overflows, surveys were made by this Office in 1906. The results of these surveys are reported, together with an outline of a plan of river improvement.

"During the survey of this valley 350 miles of levels were run, the course of the river and the lower portions of its tributaries were mapped, and 300 square miles of overflow land were examined. A line of check levels was run the entire length of the valley and 20 standard metallic bench marks were set at various important points. The cross section of the river channel was measured at 122 places, and a record was kept at various locations of the stage of water in the river during the period covered by the survey. . . .

"About 161,800 acres of land will be directly affected by the plans proposed, which if carried out will cost in round numbers $1,703,000, or an average of $10.52 an acre if the entire cost is assessed against the land. The plan upon which this estimate is made consists of—

"(1) The removal of obstructions of all kinds from the bottom and banks of natural channels.

"(2) Substantial levees on each side of the channel of the river 900 feet apart on the lower section, and return levees on each side of the channels of the larger tributaries.

"(3) The removal of all brush and trees from land lying between levees.

"(4) Interior drainage by means of ditches with outlets through the levees into the channels by means of sluice gates.

"(5) Cutting a few bends, where found practicable, in the upper section of the river."

The cost of improvements is discussed, detailed maps and estimates being given.

Farm drainage operations, W. H. Day (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 29-40, figs. 4, dgm. 1*).—This is a reprint, with slight additions, of a pamphlet prepared for general circulation among landowners who wish to begin work in farm drainage. Simple detailed directions are given for the various operations connected with laying out and constructing a system of farm drainage, such as determining the fall along the line of the proposed ditch location by the use of a homemade drainage level, constructing a profile from the level notes and determining the best grade to be adopted for the ditch, methods of digging the drain with plow and shovel, grading the bottom of the ditch and laying tile, determining the proper size of tile to be used, and determining the depths and the distances between parallel lines of tile most suitable for different kinds of soil. In conclusion the question of cooperation in drainage work between landowners, both with and without legal proceedings, is briefly discussed.

The use of the split-log drag on earth roads, D. W. King (*U. S. Dept. Agr., Farmers' Bul. 321, pp. 14, figs. 5*).—Directions are given for the construction of the split-log drag and its use on earth roads. It is stated that among the advantages to be gained from the persistent use of a road drag are the maintenance of a smooth, serviceable earth road free from ruts and mudholes, the obtaining of such a road surface with the expenditure of very little money and labor in comparison with the money and labor required for other methods, and the reduction of mud in wet weather and of dust in dry weather.

Progress reports of experiments with dust preventives (*U. S. Dept. Agr., Office Pub. Roads Circ. 89, pp. 26*).—A series of experiments with dust preventives, carried on at Wayland, Mass., Washington, D. C., and Bowling Green, Ky., during the summer of 1907 is reported, together with further observations on roads at Jackson, Tenn., which were treated in 1905 (E. S. R., 18, p. 289).

At Wayland on a mixed trap and granite macadam, which had been built about 10 years, oil emulsion, water gas tar, coal tar, a mixture of water-gas tar and coal tar, and special tar mixtures and preparations were applied to small sections. The total cost ranged from 1.7 to 3.8 cts. per square yard for the oil emulsion, 1.5 to 12.9 cts. for the water-gas tar, 8.8 to 12.9 cts. for the coal tar, and 6.2 to 31.6 cts. for the mixtures and special preparations. Nearly all the sections were reported as in good condition at the end of 3 months. Water-gas tar is deemed a satisfactory dust layer and preventive when used in moderate quantities on roads already in good condition.

Solutions of calcium chlorid of specific gravity 1.053 to 1.060 were applied to a macadam driveway in the grounds of this Department at Washington at a cost for 5 applications of 2.35 cts. per square yard. After the second application the road surface, which had seemed loosely knit together and subject to excessive leveling in spots, became compact and resilient.

In the experiments at Bowling Green rock asphalt was tested as to its fitness as a binder in macadam construction, and was applied at a total cost of 47.63 cts. per square yard. After 4 months the appearance of the roadway had undergone no appreciable change. Crude oil and a special oil preparation were applied to gravel and macadam roads at costs ranging from 1.17 to 2.86 cts. per square yard as dust preventives with apparently satisfactory results.

At Jackson the treatment with tar is considered on the whole as very satisfactory. Crude and steamer oils have left no appreciable effects, but good results are still apparent where the roads were treated with the residual oils, these sections being still practically dustless and free from all washing.

RURAL ECONOMICS.

The Russian peasantry, O. Grünberg (*Mitt. Liv-Estländ. Bur. Landeskult., Jahrb. 1906–7, pp. 1–32*).—This article briefly outlines the land system of Russia which has developed since 1861, and gives in more detail the conditions of life of the peasants, the communal system of living, and the present needs of the peasantry. One of the greatest drawbacks to the economic progress of the farmers is held to be the small size of the peasant holdings. As about 80 millions of population in Russia depend directly or indirectly upon agriculture as a means of livelihood, increase in the size of holdings, better systems of culture, and improvement in the system of taxation are urged as among the steps the government should take for promoting the welfare of the peasant class.

The economic relations of peasant farms, VON HERBST (*Landw. Jahrb.*, *37* (*1908*), *No. 2*, *pp. 381–422*).—This article tabulates and discusses the land values, capital invested in buildings and live stock, and detailed economic operations of 19 farms situated in 9 different districts of Germany, containing about 1,340 acres of land.

The returns from a large-size farm in Prignitz, VON PUTLITZ (*Landw. Jahrb.*, *36* (*1907*), *No. 5–6*, *pp. 863–908*).—This article presents the detailed operations of a large farm for a number of years, with a discussion of the results of the inquiry as applied to the economic welfare of proprietors and all classes of farm help.

The agricultural labor problem, VON BRAUN (*Vrtljschr. Bayer. Landw. Rat.*, *12* (*1907*), *No. 4*, *pp. 489–501*).—This article gives a general review of the farm labor problem in Germany with particular reference to Bavaria. The causes leading to the scarcity of farm labor and the abandonment of farms are reviewed in detail and the so-called advantages of the industrial worker over the average condition of the farm laborer are shown to be without foundation. In the author's opinion the remedy for the agricultural labor problem lies in affording opportunities to farm laborers to attain to better paying positions in farm life and in a system of land colonization by settling workmen with families on the land.

Agriculture and the American panic, VERNIEUWE (*Jour. Soc. Cent. Agr. Belg.*, *55* (*1908*), *No. 5*, *pp. 142–147*).—This paper by the director of the ministry of agriculture discusses the American credit system, its relation to financial panics, and the effects of the recent panic on the agricultural industry in the United States and Europe.

Agricultural legislation in France, H. L. RUDLOFF (*Landw. Jahrb.*, *37* (*1908*), *No. 1*, *pp. 1–43*).—In this article extracts of the laws relating to trade organizations, mutual credit societies and banks, agricultural warrants, cooperative organizations, and insurance societies are presented and discussed, together with statistical data on their development, membership, and financial standing.

The law of December 29, 1906, and the agricultural cooperative societies, L. TARDY (*Rev. Vit.*, *29* (*1908*), *No. 745*, *pp. 345–349*).—The main provisions of the law regulating the control of the government loan of 40,000,000 francs for agricultural cooperation are discussed, and the advantages to cooperative societies of being able to borrow capital under its provisions are illustrated by means of an account of the progress made by the wine cooperative society of Camps which borrowed capital for 20 years at 1.5 per cent interest.

Cooperative societies of production, DE GUILLEBERT DES ESSARS (*Prog. Agr. et Vit.* (*Ed. l' Est-Centre*), *29* (*1908*), *No. 15*, *pp. 455–459*).—This is a plea that societies of agricultural laborers for the cooperative production of crops which have been or may be formed in France should be entitled to the privileges of securing credit under the provisions of the law of December 29, 1906.

Agricultural credit banks in the colonies (*Jour. Bd. Agr.* [*London*], *14* (*1908*), *No. 11*, *pp. 689–691*).—The government of the Cape of Good Hope has passed a law advancing the sum of £1,000,000 for the purpose of furnishing credit to farmers desirous of improving their property and promoting agricultural interests. Loans may be made from £50 to £3,000 at 5 per cent interest, secured by first mortgage not exceeding two-thirds the value of the property.

The Transvaal government has authorized the use of £2,500,000 for similar purposes, and Natal and Western Australia have passed laws to furnish agricultural credit to farmers on approved land and improvements security for loans ranging from £50 to £1,500.

Transvaal land and agricultural bank (*Transvaal Agr. Jour.*, *6* (*1908*), *No. 22*, *pp. 331, 332, 369*).—The purpose of this bank is to promote agriculture and stock raising by furnishing money to farmers on land values at 6 per cent interest. Loans to the amount of £20,000 were granted during the first month of the bank's existence.

A circular gives information as to the method of securing loans, security required, kinds of loans, application fees, loans to cooperative societies, etc.

Cooperative credit [in India], W. R. Gourlay (*Dept. Agr. Bengal Quart. Jour., 1 (1908), No. 3, pp. 172–181*).—The author discusses the origin, development, and mode of operation of agricultural cooperative credit societies in India.

As a result of 3 years' work, these societies now number 735, and interest for money borrowed on personal security ranges from 12.5 to 18.75 per cent, as compared with 25 to 50 per cent as charged by money lenders. The principles under which the societies operate are the same as the Raiffeisen societies, namely, unlimited liability of the members, operations restricted to a small area, no shares and consequently no dividends, no payment for services rendered, repayment of the loan from the profits or savings effected, an indivisible reserve fund, and the moral and material benefit of the members.

The agricultural colonization of Texas, T. Tabet (*Agr. Colon. [Italy], 2 (1908), No. 1, pp. 20–50, figs. 16*).—This is a description of a trip through Texas and near-by States, with statistical data of population, agricultural production, mineral wealth, etc. The purpose of this investigation was to determine the suitability of Texas for the settlement of Italian immigrants who desire to engage in agriculture.

Census of population and agriculture of the Northwest Provinces, S. A. Fisher (*Ottawa: Govt., 1907, pp. XXXII+160*).—Complete data as to population, extent of areas cultivated and uncultivated, acreage and yields of crops, and number of live stock in the provinces of Manitoba, Saskatchewan, and Alberta in 1906 are tabulated and discussed. The towns and cities are growing in population faster than the rural districts, the ratio of urban to rural population in 1906 being 30.23 : 100 as compared with 24.72 : 100 in 1901.

Agricultural census of Ontario, Quebec, and the Maritime Provinces, 1907, A. Blue (*Census and Statis. [Canada], Bul. 5, pp. 45*).—Statistics of farm lands, field crops, and live stock for the five provinces by counties are reported.

Agricultural statistics of Eastern Bengal and Assam for the year 1906–7, S. G. Hart (*Agr. Statis. East. Bengal and Assam, 1906–7, pp. 31*).—General returns showing total acreage, classification of areas, acreage in crops, number of live stock, plows, and carts, extent of irrigation, population, and land transfers are reported.

Agriculture and pastoral industry [in New South Wales], H. C. L. Anderson (*Off. Yearbook N. S. Wales, 1905–6, pp. 338–404, pls. 4*).—Statistical data on the acreage and yields of crops and number of live stock in 1906 and preceding years are tabulated and discussed. The area under cultivation including sown grass land was 3,465,611 acres, or 2.3 acres per inhabitant.

Rural settlement, H. C. L. Anderson (*Off. Yearbook N. S. Wales, 1905–6, pp. 125–151*).—Excluding land held by tenants of the crown, there were in New South Wales in 1906, 77,136 holdings of 1 acre and upwards in extent. The land occupied was 48,728,542 acres, the average size of the holding being 632 acres. Of the total number of holdings 42,776 were occupied by freeholders, 14,921 by absolute tenants of private lands, and 13,321 by persons who possess freeholds with crown lands attached.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 6, pp. 41–48*).—Notes are given on the crop conditions in the United States and foreign countries, with statistics on the acreage, values, and prices of the more important agricultural products.

AGRICULTURAL EDUCATION.

Report on agricultural education in the United States, E. Howard (*Jour. Bd. Agr. [London], 14 (1908), No. 10, Sup., pp. 61*).—This report was prepared by the Councillor of the British Embassy at Washington at the request of the committee on agricultural education of the Board of Agriculture of Great Britain. It includes briefs of Federal legislation for the establishment of agricultural and industrial colleges, statistics of the agricultural colleges and experiment stations, and descriptions, with liberal quotations from courses of study, of leading colleges and secondary schools of agriculture in the United States, as well as some discussion of agriculture in elementary schools. Liberal excerpts are taken from the progress reports of this Office on agricultural education and other similar publications. Two appendixes contain a summary of the laws passed since 1905 in regard to agricultural education and a memorandum of legislation relating to agricultural education by the State legislatures in 1907.

Centennial celebration of the founding cf the University of Tennessee, 1907 (*Univ. Tenn. Rec., 10 (1907), No. 7, pp. 79*).—Addresses given at the exercises commemorating the one hundredth anniversary of the founding of the University of Tennessee, June 1–4, 1907.

The education of foresters, B. E. Fernow (*Canad. Forestry Jour., 3 (1907), No. 4, pp. 143–151*).—This paper contains a discussion of the science of education for foresters and deals briefly with three plans, one providing merely for the work of one professor in a college who would teach all that a forester would be likely to be called upon to apply at the present time, another plan expanding on the practical side to include a training school which would lay stress on manipulation and operation, and a third providing for a full college course which should in no way be inferior to the best forestry course in Germany. Taking up the third plan, which is the one adopted in the course at the University of Toronto, the author discusses in considerable detail the essential features of such a course, including instruction in botany, geology, zoology, and other related sciences and instruction and practice in the different branches of forestry. The technical forestry courses at Toronto are given in detail with the hours allotted to each.

Household science at the University of Illinois, Isabel Bevier (*Ill. Agr., 12 (1908), No. 5, pp. 127–129*).—A history of the household science movement at the University of Illinois. Of the 28 students who have graduated from this department, 7 are teaching household science in public schools, 3 in other than public schools, 4 in universities, 1 is a university laboratory assistant, 4 are teaching studies other than household science, 1 is manager of a lunch room, 1 is taking graduate work, 3 are married, and 4 are at home.

Agriculture in secondary schools, T. F. Hunt (*Penn. School Jour., 56 (1908), No. 8, pp. 328–335*).—This is an address given before the High School Department of the State Educational Association of Pennsylvania, December 26, 1907. The author discusses secondary education and its value in special and short courses in colleges of agriculture, in secondary schools of agriculture in connection with colleges, and in special agricultural schools as in Georgia, Alabama, and Wisconsin, the Davis bill and what it would mean to Pennsylvania, and the introduction of agriculture into public high schools. He also reviews the reports of the committee on instruction in agriculture of the Association of American Agricultural Colleges and Experiment Stations on secondary courses in agriculture, and gives liberal quotations from two of these reports.

Short lessons in agriculture brought to the young man on the farm, A. J. Bill (*Ill. Farmers' Inst. Bul. 10, pp. 40, figs. 11*).—This is a report of the second annual meeting of the Grout Encampment and Farm School at Keillor Park stock farm near Winchester, Ill., August 26–31, 1907. The various features of instruction are described in considerable detail.

Report of the nature study department, S. B. McCready (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 33 (1907), pp. 264–276*).—An account is given of the course in nature study and elementary agriculture, the school gardens, the summer class in agriculture, domestic science and manual training at the Macdonald Institute, teachers' conventions, visitors, special lecturers, etc., training of teachers in elementary agriculture, training of teachers elsewhere, and agricultural high schools. A proposed course in elementary agriculture for teachers, to cover the qualifications required by the Macdonald Institute, is outlined. Ontario is endeavoring to solve partially the problem of introducing agriculture into the rural schools by giving agricultural instruction in the high schools, such instruction being now given in the high schools at Essex, Galt, Collingwood, Lindsay, Morrisburg, and Perth.

Outdoor art for the country school, O. J. Kern (*School News and Pract. Ed., 21 (1908), No. 7, pp. 305–307, figs. 3, dgm. 1*).—The author, in discussing planting plans for country school grounds, gives some attention to the principles of planting, and tells what to plant in the way of annuals, perennials, vines, shrubs and trees, and how to care for these after planting.

Our school garden, Jessie P. Learoyd (*Jour. Ed. [Boston], 67 (1908), No. 9, pp. 233–235, fig. 1*).—An account of the school garden work at the Salem (Massachusetts) State Normal School in 1907. The books found useful are mentioned, a chronological summary is given of the work of the year, and this is followed by some notes on the educational value of this work.

Work of the Cleveland Home Garden Association (*Ann. Rpt. Home Gard. Assoc. [Cleveland], 8 (1907), pp. 31, figs. 18, dgm. 1*).—This report contains a discussion of the value of gardens for children and details concerning the work of the year in seed distribution, lectures, school gardens, flower shows, branch associations, botanical gardens, school grounds, vacant lots, and training gardens.

International children's school farm league (*Internat. Children's School Farm League Ann. Rpt., 1 (1907), pp. 19, pls. 9*).—This report contains an account of the organization and purpose of the league, a description of the children's school farm at the Jamestown Exposition and the work done by the children on the farm, and a few extracts from the children's diaries giving their viewpoint.

Agriculture, domestic art, and manual training without funds or equipment, E. C. Bishop (*Addresses and Proc. Nat. Ed. Assoc., 45 (1907), pp. 1075–1084*).—An address given before the National Education Association in 1907, dealing mainly with the work of a number of schools in Nebraska where considerable industrial work has been carried on at the homes of pupils under the supervision and direction of teachers.

Proceedings of the twelfth annual meeting of the American Association of Farmers' Institute Workers, edited by W. H. Beal and J. Hamilton (*U. S. Dept. Agr., Office Expt. Stas. Bul. 199, pp. 79*).—This is a detailed account of the proceedings of the meeting held at Washington, D. C., October 23–24, 1907, which has been previously noted (E. S. R., 19, p. 297).

California State Farmers' Institute at the University Farm, Davisville, W. T. Clarke (*California Sta. Circ. 34, pp. 3*).—A schedule of exercises for the California State Farmers' Institute held at the University Farm, October 29–31, 1907.

Utah State farmers' institutes (*Utah Farmers' Inst. Ann., 1907, pp. 85, figs. 16*).—A report of farmers' institutes in Utah for the year ended June 30, 1907, with addresses given at these institutes.

MISCELLANEOUS.

Eighteenth Annual Report of Arizona Station, 1907 (*Arizona Sta. Rpt. 1907, pp. 205-244*).—This consists of the organization list, an administrative report on the work of the station as a whole and six departmental reports. These reports contain a financial statement for the fiscal year ended June 30, 1907, notes on the culture of date palms, broad beans, and horse beans, the protection of plants from extremes of climate, the selection of seeds by specific gravity, contagious abortion in cattle, arbor day plantings, codling moth, work under way in vegetable physiology and pathology, the relation of copper mining detritus to agriculture, the chemical composition of dates, and other subjects noted in part elsewhere in this issue.

Twentieth Annual Report of Kansas Station, 1907 (*Kansas Sta. Rpt. 1907, pp. 4+XXVI*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1907, and reports of the director and heads of departments. The report is also issued in bound form, including in addition reprints of Bulletins 140-147 and an index to these bulletins.

Thirtieth Annual Report of North Carolina Station, 1907 (*North Carolina Sta. Rpt. 1907, pp. 74+55*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1907, reports of the director and heads of departments, of which that of the chemist is abstracted on page 1134 of this issue, numerous special articles abstracted elsewhere in this issue, and reprints of press bulletins on A Serious Lettuce Disease and Treatment of Oats, Wheat, Rye, or Barley for Smut, and of Bulletins 195 and 196.

Report of work at the Delta Station for 1906, J. W. Fox (*Mississippi Sta. Bul. 106, pp. 7*).—This contains notes as to the improvements made at the Delta substation, a report on field crops noted on page 1133 of this issue, and a brief account of an experiment in pasturing pigs on red clover, early corn, and peas.

NOTES.

Tuskegee Institute and Station.—Floyd A. Green, head of the creamery department, has resigned to become connected with the United States Indian School Service at Greenwood, S. Dak.

Arkansas Station.—Dr. W. M. Bruce, of the University of Chicago, has been appointed chemist, vice J. H. Norton, resigned to accept a newly established position in the California Station as chemist in connection with soil and fertilizer investigations in southern California.

California University and Station.—Leroy Anderson has been appointed professor of dairy industry with H. A. Hopper, of the Indiana Station, as assistant professor, and E. H. Hageman in charge of dairy manufactures. E. W. Major is to devote himself entirely to the work in animal husbandry. J. W. Mills resigned July 1 to engage in commercial work, and was succeeded as superintendent of the Riverside Station by Thomas F. Hunt, the assistant horticulturist. In the department of entomology W. B. Herms has been appointed assistant, C. Fuchs curator, and H. J. Quayle, W. H. Volck, Earl Morris, and J. S. Hunter field assistants at Whittier, Watsonville, San Jose, and San Mateo, respectively.

Florida University.—J. J. Vernon, formerly of the New Mexico College and Station, has been appointed agriculturist and has entered upon his duties.

Kansas College.—The degree of D. Sc. was conferred upon J. T. Willard by the college at its recent commencement.

Maryland College.—Gustav E. Cohen, assistant professor of chemistry, has resigned to engage in commercial work. Alvah J. Norman, formerly assistant in horticulture at the Alabama College and Station, has accepted a position as assistant in the department of plant pathology.

Massachusetts Station.—A joint meeting with the State board of agriculture was held at Ludlow July 21, a demonstration of methods of curing foul brood in bees being given.

Minnesota University and Station.—H. J. Franklin has been appointed assistant professor of entomology in the university and assistant entomologist in the station.

Missouri University.—The college of agriculture will offer but two short courses in agriculture for boys during farmers' week in January, 1909. One course, open to boys between the ages of 10 and 16 years, will continue one week, and the other, open to boys between 16 and 20 years, will continue 10 days. The first course will include lessons in corn and stock judging, dairying, and horticulture, and the second is intended to bring out the most important principles of farm practice, including the judging and selection of animals, the judging and testing of seed corn, and the principles of dairying, veterinary practice, and fruit growing.

New Mexico College and Station.—Dr. W. E. Garrison has been elected president of the college and has entered upon his duties. W. G. Hummel, of the Colorado College and Station, has been appointed assistant in agronomy.

New York State Station.—The State appropriation of $32,500, erroneously announced in a previous issue as granted for the erection of an auditorium, is to be used for the building of five additional residences on the station grounds for the heads of departments.

North Carolina College.—Press reports announce the election of Dr. David H. Hill, vice-president of the college, to succeed Dr. G. T. Winston, as president.

Oklahoma College.—In accordance with the requirements of a recent act of the Oklahoma legislature the college has created a chair of agriculture for schools, and E. E. Balcomb, formerly teacher of agriculture at the Southwestern State Normal School at Weatherford, Okla., has been chosen for the position.

Oregon College and Station.—To keep pace with the very rapid growth of the college a new agricultural hall has been planned. One wing, about 72 by 130 ft., three stories and basement, to cost approximately $40,000, will be ready for occupancy this fall. This wing will be mainly occupied by the department of agronomy, and represents about one-fourth of the area of the building when completed. The present agricultural hall will be utilized by the department of chemistry. A modern and commodious barn is also ready for occupancy, which when completed will cost $25,000.

A very successful demonstration train was recently sent out through the wheat-producing section of the Columbia River basin. Methods for conservation of soil fertility and moisture, and animal husbandry in its relations to wheat growing, were the principal subjects discussed. The interest in this work was strongly manifested by the attendance, which in seventeen stops aggregated 3,000 farmers.

Recent appointments include George R. Hyslop as assistant in agronomy and Otto G. Simpson as assistant in dairy husbandry.

Pennsylvania College and Station.—C. E. Myers has been appointed assistant in horticulture.

Rhode Island Station.—Philip B. Hadley, Ph. D., of Brown University, has been appointed chief of the division of biology, vice Dr. Leon J. Cole, whose resignation has been previously noted, and J. S. Irish of the University of Maine has been appointed assistant in biology. With the beginning of the present fiscal year, G. E. Adams retires from the station as associate in agronomy to devote himself mainly to the college work, but will continue in charge of experiments in floriculture. A. L. Whiting, a recent graduate of the Massachusetts College, has been appointed assistant in agronomy. W. F. Schoppe, assistant in feeding experiments, has resigned to accept a position with the Montana College and Station.

The station is preparing to increase the volume of cooperative experiments.

South Carolina Station.—W. A. Thomas has been appointed assistant in the division of zoology and entomology, and has entered upon his duties.

South Dakota College and Station.—T. Herbert Lund has been appointed assistant in dairy husbandry.

Utah College and Station.—W. W. McLaughlin has resigned to take charge of the irrigation investigations in Utah of this Office, but will act as consulting irrigationist for the station until a successor is appointed. J. E. Greaves has returned from his leave of absence and will have charge of the chemical work during the absence of Robert Stewart, who has been granted leave of absence for graduate study. T. E. Woodward, of the Dairy Division of this Department, has accepted the position of dairyman in the college and station, beginning work August 1. E. H. Favor, of the Missouri University and Station, has been appointed assistant professor of horticulture, and will have charge of the work in botany and plant pathology. John Stephens, assistant agronomist in the station, has resigned to accept a position with the dry land investigations of the Bureau of Plant Industry of this Department. The management of the arid farm experiments of the station has been placed in charge of L. A. Merrill, superintendent of extension work. Following the resignation of J. A. Bexell to accept a position as dean of the school of commerce and financial secretary of the Oregon College, J. L. Coburn has been appointed financial secretary and John T. Caine, jr., recording secretary.

Washington College and Station.—W. A. Linklater has resigned to accept a position as animal husbandman in the Oklahoma College and Station, and H. R. Watkins, assistant chemist, has resigned to accept a position as assistant chemist in the Office of the Surgeon-General of the War Department. Ira P. Whitney, instructor in dairying in the college, has been added to the station staff as dairy expert, and will devote the summer to investigation of dairy problems.

Agricultural Education at the Cleveland Convention of the National Education Association.—At the 1908 convention in Cleveland, June 29 to July 3, an unusual amount of attention was given to vocational training. As one prominent educator expressed it, "manual training, domestic science and art, trade, handicraft, and agricultural and technical instruction have dominated the programmes and formed the chief themes of conversation."

This interest in vocational instruction was clearly apparent not only in the meetings of sections primarily organized for the consideration of the industrial features of education, but also in several other section meetings and in the general sessions of the association. The annual presidential address, by Nathan C. Schaeffer, of Pennsylvania, dealt with Education for Avocation. The president-elect of the association, Dr. L. D. Harvey, has been closely identified with the development of agricultural education and county agricultural schools in Wisconsin.

The standing committee of the association on industrial education for rural schools submitted its third report, this including special reports by D. J. Crosby, of this Office, and O. J. Kern, of Rockford, Ill., on instruction in agriculture as it is now being conducted in four different types of schools. The conclusions of the committee based upon these special reports and upon their observation of the work being done in one-room rural schools were to the effect that while examples of successful industrial work in the one-room schools are reported from time to time, this success is due almost entirely to the preparation and personality of the teacher, and that while successful experiments in school gardening, nature study, and elementary agriculture in such schools awaken a general interest in this subject, at the same time they are demonstrating the inadequacy of this work in the district school with one teacher to meet the needs of the children in rural communities. Hence "the committee can not escape the conviction that adequate facilities for meeting the increasing demand for industrial education must come through schools of secondary type, and that it is easier at the present time to secure this instruction in adequate form in schools which are distinctively organized for the special work. . . . For such schools it is possible to secure appropriations far in excess of what can be secured for the ordinary high school or the consolidated school. This will make it possible to command the services of better trained teachers and secure better equipment for work. It will dignify the whole subject of industrial education in the estimation of the farming population, and will open up possibilities of utilizing such schools for carrying on this work still further than is done at present."

The department of rural and agricultural education, which was organized in Washington, D. C., in February, 1908, presented its first programme at the

Cleveland convention. It held one session in conjunction with the department of technical education, at which a paper by Dr. A. C. True and D. J. Crosby, of this Office, defining agriculture as a science and an art and outlining the field of elementary, secondary, and collegiate institutions in agricultural education, was presented by Mr. Crosby, and discussed by C. F. Curtiss and A. B. Storms of Iowa, J. L. Snyder of Michigan, and others. One of the regular sessions of the department was devoted to general addresses and discussions on agricultural education, including a paper on What Constitutes Successful Work in Agriculture in Rural Schools, by B. M. Davis, of Miami University, Oxford, Ohio; an address on The Work of the Normal School in Preparing Teachers to Teach Agriculture, by H. G. Williams, dean of State Normal College, Athens, Ohio, and an address on National Aid in Agricultural Education, by Elmer E. Brown, United States Commissioner of Education. Dr. Brown indorsed most emphatically and earnestly the proposition that children should be educated largely in and through the common things about them, the things touching their home interests, and the vocations of their parents—agriculure for children in rural communities. He expressed a belief in the principle of Government aid for education of this sort, but was of the opinion that the means of extending Government aid to education along these lines should be thoroughly investigated before the enactment of additional legislation.

The evening session of the department was devoted to illustrated addresses on school gardening. Opportunity was afforded during the convention to visit the work at the different schools in Cleveland and at the different centers conducted by the Home Gardening Association.

Several other departments of the association devoted space in their programmes to the discussion of different features of agricultural education. The department of normal schools spent most of the time of one session upon the discussion of industrial arts in normal schools. A paper on this subject was read by H. H. Seerley, of Iowa, who confined his discussion largely to the agricultural features of industrial instruction. In the department of manual training, Charles H. Morse, secretary of the Massachusetts Commission on Industrial Education, discussed the most urgent educational need of to-day, which in his opinion is industrial training in public schools, including agricultural education. In the department of science instruction one evening was devoted to an address on Scientific Agriculture in the Secondary School, by L. H. Bailey, and a paper on The Preservation of the Natural Resources of the United States, by H. A. Smith, of the Forest Service. The department of Indian education considered several features of industrial training for the Indian, including a paper on Horticulture and Landscape Gardening, by R. H. Hoffman, florist at the Indian Industrial School, Carlisle, Pa.

There were also short meetings of several societies whose work is more or less closely related to that of the National Education Association. Among these were the National Committee on Agricultural Education and the American Nature Study Society. The latter discussed at length the training of teachers of nature study.

Graduate School of Home Economics.—The Graduate School of Home Economics held its second session at the college of agriculture, Cornell University, July 13–24, with representatives from eleven States and Canada. The programme covered a wide range of subjects, and the instruction corps included some of the leading teachers and investigators in home economics and related lines. Practical demonstrations of household appliances were given by Misses Van Rensselaer and Rose, of the department of home economics in Cornell University. Special lectures were delivered by Prof. L. B. Mendel, of the Sheffield Scientific School of Yale University, on Foods and Dietary Standards, and by Prof. Dr. N. Züntz, of the Royal Agricultural College of Berlin, on Food Values. The profit and interest of the session were also much enhanced by the lectures of the Graduate School of Agriculture, notably those of Drs. Mendel, Armsby, and Züntz.

Association of Agricultural School Teachers.—An association of agricultural school teachers has been formed in Wisconsin with Principal K. L. Hatch, of the Winnebago County School of Agriculture and Domestic Economy, at Winneconne, as president; Miss Emma Conley, of Wausau, as secretary, and W. F. Handchin as treasurer. The purpose of the association is to bring together all persons who are interested in the teaching of agriculture and domestic science in the public schools. It is the desire of the association to affiliate with the State college of agriculture for the purpose of improving the work of teaching agriculture in the schools of the State.

Agricultural Work in Central America.—In a recent decree, the president of Costa Rica has ordered the establishment of agricultural boards in all the cantons except San José. These boards are to consist of seven members each, and are under the control of the National Society of Agriculture. Their general functions and duties are to be the furtherance and development of agriculture.

By a decree of President Zelaya, a superior council, boards and committees of agriculture and stock raising have been established in Nicaragua. The council is a national body composed of five members and has jurisdiction over the boards which are located in the departments and also of the committees which are formed in the towns and villages.

Model Poultry Farm in Peru.—As the result of an act passed by the Peruvian Government in September 18, 1907, a model poultry farm has been established at the National Agricultural and Veterinary School, Lima, for the purpose of giving instruction in aviculture in this institution.

Agricultural Instructors in Prussia.—*Landwirtschaftliches Wochenblatt für Schleswig-Holstein*, of April 10, 1908, contains the new directions for the training and examination of agricultural instructors in Prussia, promulgated by the minister of agriculture, domains and forests and the minister of religion, instruction and medicine. The directions concerning instructors in the agricultural schools will go into effect April 1, 1909, and those concerning the instructors in the farm schools and winter schools and the itinerant agricultural instructors, April 1, 1911.

Irrigation Work in India.—According to a note in *Science* it is proposed by the Indian Government to connect the five rivers in the Punjab district in such a way as to equalize the flow of water when one or more rivers is in flood. In this way the Punjab will be given a water supply sufficient for irrigation at all times. In connection with this and other projects, including the eventual reclamation of the Runn of Cutch, it is stated that the irrigation department has work in hand, on plans that have been adopted, to engage the time, energies, and available capital for 30 years.

Miscellaneous.—H. E. Cook, of Denmark, New York, has been appointed dean of the school of agriculture of St. Lawrence University.

J. R. Ainsworth Davis, of the University College of Wales, has been appointed principal of the Royal Agricultural College of Cirencester.

Governor Guild, of Massachusetts, has appointed a State conservation commission, consisting of F. W. Rane, State forester, chairman; Prof. George F. Swain, of the Massachusetts Institute of Technology, and President K. L. Butterfield, of the Massachusetts Agricultural College, to act in cooperation with the National Conservation Commission.

Nature states that a bill to promote agricultural education and nature study in the English public elementary schools has been introduced into the House of Commons and given a second reading. The bill provides for the teaching of agricultural and horticultural subjects, the construction of school gardens, and such collections as may be necessary for the practical illustration of the instruction given. The courses specified are to be optional in urban schools but compulsory in the rural and semi-rural districts. A special grant not to exceed 75 per cent of the cost is authorized to be applied toward the expenses of local educational authorities in carrying out the provisions of the bill.

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